FRM®

PRACTICE EXAM PART II 2022

GARP
FRM | Financial Risk Manager

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Introduction

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

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

The 2022 FRM Pre-Study Part I and Part II Practice Exams have been developed to aid candidates in their preparation for the FRM Exam in May and November 2022. 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 2022 FRM Exam.

The 2022 FRM Part I Practice Exam contains 100 multiple-choice questions and the 2022 FRM Part II Practice Exam contains 80 multiple-choice questions, the same number of questions that the actual 2022 FRM Exam Part I and 2022 FRM Exam Part II will contain. As such, the Practice Exams were designed to allow candidates to calibrate their preparedness both in terms of material and time.

The 2022 FRM Practice Exams do not necessarily cover all topics to be tested in the 2022 FRM Exam as any exam 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 2022 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 2022 FRM Exam Study Guide and 2022 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 2022 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 continuously-compounded annual rates.
2. Unless otherwise indicated, option contracts are assumed to be on one unit of the underlying asset.
3. ALCO = asset-liability committee
4. bp(s) = basis point(s)
5. CAPM = capital asset pricing model
6. CCP = central counterparty or central clearing counterparty
7. CD = certificate of deposit
8. CDO = collateralized debt obligation(s)
9. CDS = credit default swap(s)
10. CEO, CFO, CIO, CRO, and CTO: chief executive, financial, investment, risk, and technology officers, respectively
11. CVA = credit value adjustment
12. ERM = enterprise risk management
13. ES = expected shortfall
14. ETF = exchange-traded fund
15. EWMA = exponentially weighted moving average
16. GARCH = generalized auto-regressive conditional heteroskedasticity
17. GDP = gross domestic product
18. IT = information technology
19. LIBOR = London interbank offered rate
20. MBS = mortgage-backed-security(securities)
21. NAV = net asset value
22. OECD = Organization for economic cooperation and development
23. OIS = overnight indexed swap
24. OTC = over-the-counter
25. RAROC = risk-adjusted return on capital
26. SOFR = secured overnight financing rate
27. VaR = value-at-risk
28. SPV = special purpose vehicle

29. 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	EU currency

Acronym	Currency
GBP	British pound sterling
INR	Indian rupee
JPY	Japanese yen
KRW	South Korean won
SGD	Singapore dollar
USD	US dollar

2022 FRM Part II Practice Exam – Candidate Answer Sheet

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

1. A global bank possesses subsidiaries with banking licenses in various countries, including Singapore, Australia, and UK. Regulators in these countries have recently announced their intention to examine the bank's risk culture framework and its policies regarding conduct and culture. According to best practices described in recent publications, which of the following actions would the regulators most likely perform?

A. Increase the bank's operational risk capital requirements.
B. Review the bank's accountability standards for its senior management.
C. Require that the bank implement quantitative approaches to model conduct and culture.
D. Recommend that the bank increase the proportion of incentive compensation for its traders and investment bankers.

2. A risk manager is estimating the market risk of a portfolio using both the arithmetic returns with normal distribution assumptions and the geometric returns with lognormal distribution assumptions. The manager gathers the following data on the portfolio:

- Annualized average of arithmetic returns: 16%
- Annualized standard deviation of arithmetic returns: 27%
- Annualized average of geometric returns: 13%
- Annualized standard deviation of geometric returns: 29%
- Current portfolio value: EUR 5,200,000
- Trading days in a year: 252

Assuming both daily arithmetic returns and daily geometric returns are serially independent, which of the following statements is correct?

A. The 1-day normal 95% VaR is equal to 1.63% and the 1-day lognormal 95% VaR is equal to 1.76%.
B. The 1-day normal 95% VaR is equal to 2.69% and the 1-day lognormal 95% VaR is equal to 2.88%.
C. The 1-day normal 95% VaR is equal to 2.74% and the 1-day lognormal 95% VaR is equal to 2.92%.
D. The 1-day normal 95% VaR is equal to 3.26% and the 1-day lognormal 95% VaR is equal to 3.48%.

3. A credit manager in the counterparty risk division of a large bank uses a simplified version of the Mertonmodel to monitor the relative vulnerability of its largest counterparties to changes in their valuation and financial conditions. To assess the risk of default of three particular counterparties, the manager calculates the distance to default assuming a 1-year horizon (t=1). The counterparties: Company P, Company Q, and Company R, belong to the same industry, and are non-dividend-paying firms. Selected information on the companies is provided in the table below:

Company	P	Q	R
Market value of assets (EUR million)	100	150	250
Face value of debt (EUR million)	60	100	160
Annual volatility of asset values	10.0%	7.0%	8.0%

Using the information above with the assumption that a zero-coupon bond maturing in 1 year is the only liability for each company, and the approximation formula of the distance to default, what is the correct ranking of the counterparties, from most likely to least likely to default?

A. P; R; Q
B. Q; P; R
C. Q; R; P
D. R; Q; P

4. Bank HJK has written puts on Bank PQR stock to a hedge fund and sold CDS protection on Bank PQR to a manufacturer. Bank HJK and Bank PQR operate in several of the same businesses and geographies and their performances are highly correlated. Many in the market are concerned that rising interest rates could negatively impact the credit quality of Bank HJK's numerous borrowers, which in turn would increase the credit spread of Bank HJK. From the perspectives of the hedge fund and the manufacturer, which of the following is correct with respect to their counterparty risk exposure to Bank HJK?

	Hedge Fund	Manufacturer
A.	Right-way risk	Wrong-way risk
B.	Wrong-way risk	Right-way risk
C.	Right-way risk	Right-way risk
D.	Wrong-way risk	Wrong-way risk

5. A risk consultant has been tasked with assessing a small bank's liquidity risk profile. While reviewing a presentation produced by the bank, the consultant comes across a list of early warning indicators used to signal potentially heightened liquidity risk. Which of the following trends should the consultant consider as the strongest warning signal for potential liquidity risk at the bank?

A. Decrease in stock price of the bank's peers but not in the stock price of the bank itself
B. Increase in credit lines received from other financial institutions
C. Widening spreads on the bank's issued debt and credit default swap
D. Significant asset growth funded by an increase in stable liabilities

6. An investment bank has a one-way credit support annex (CSA) on a bilateral transaction with a hedge fund counterparty. Under the terms of the CSA, the mark-to-market value of the transaction forms the basis of the hedge fund's collateral requirements, which are provided below:

	Value (CNY)
Mark-to-market value of net exposure	25,000,000
Mark-to-market value of collateral posted	10,800,000
Threshold amount	14,000,000
Minimum transfer amount	2,500,000
Rounding amount	10,000

Assuming the net exposure increases to CNY 27,000,000 and the mark-to-market value of collateral posted has not changed, how much additional collateral will the hedge fund have to post?

A. CNY 0
B. CNY 1,990,000
C. CNY 2,000,000
D. CNY 2,500,000

7. The board of directors of an insurance company has identified a number of potential growth opportunities for the company to consider. To help assess these opportunities and determine an optimal risk structure to use across the organization, the risk committee has recommended that the company implement an ERM program. Which of the following would best represent an appropriate goal for the firm to state as part of the ERM program?

A. Determine a risk-return trade-off that reflects the company's target credit rating and ensure that business unit managers evaluate new projects with this firm-wide target in mind.
B. Attempt to eliminate the company's probability of financial distress to maximize company value.
C. Maximize the firm's leverage ratio within its risk tolerance to ensure the highest expected return on equity.
D. Establish a target minimum level of annual earnings and guarantee to shareholders that it will maintain this level.

8. A large pension fund requires that the fund's managers do not breach the 2% tracking error limit at any point in time. A fund manager's performance for the most recent period is summarized below:

- Average return: 2.8%
- Volatility of returns: 1.9%
- Average return in excess of the benchmark (average active return): 0.6%
- Volatility of active returns: 1.7%

If the current risk-free interest rate is 1.2%, which of the following is correct?

A. The manager's average active return is below 2%, therefore the manager breached the limit.
B. The manager's average return in excess of the risk-free interest rate is below 2%, therefore the manager breached the limit.
C. The volatility of active returns achieved by the manager is below 2%, therefore the manager did not breach the limit.
D. The volatility of returns achieved by the manager is below 2%, therefore the manager did not breach the limit.

9. A risk analyst is estimating the return of an investment portfolio using the Fama-French three-factor model. The analyst regresses thirty years of weekly portfolio returns against the three factors of the model. The analyst obtains the following regression results:

Factor	Coefficient
Alpha	0.10
Market loading	0.52
SMB loading	0.18
HML loading	-0.70

Assuming all estimated coefficients are statistically significant, which of the following is correct?

A. The portfolio return is positively correlated with the size factor, and this should decrease its performance since small-cap stocks generally underperform large-cap stocks over time.
B. The portfolio return is positively correlated with the value factor, and this should increase its performance since stocks with low book-to-market values generally underperform stocks with high book-to-market values over time.
C. The portfolio return is negatively correlated with the size factor, and this should increase its performance since stocks with high market capitalizations generally outperform stocks with low market capitalizations over time.
D. The portfolio return is negatively correlated with the value factor, and this should decrease its performance since value stocks generally outperform growth stocks over time.

10. An operational risk manager is asked to report a bank's operational risk capital under the Standardized Measurement Approach (SMA) proposed by the Basel Committee in March 2016. The treasury department produces the following data for the bank, calculated according to the SMA guidelines:

- Business Indicator (BI): EUR 1,200 million
- Internal Loss Multiplier: 1

In addition, the manager uses the Business Indicator buckets in the Business Component presented in the table below:

Bucket	BI Range	BI Component
1	EUR 0 to EUR 1 billion	0.12*BI
2	EUR 1 billion to EUR 30 billion	EUR 120 million + 0.15(BI – EUR 1 billion)
3	Higher than EUR 30 billion	EUR 4.47 billion + 0.18(BI – EUR 30 billion)

What is the correct operational risk capital that the bank should report under the SMA?

A. EUR 120 million
B. EUR 150 million
C. EUR 158 million
D. EUR 180 million

11. A credit manager who is well versed in lessons learned from the 2007–2009 subprime mortgage crisis in the US is overseeing the structured credit book of a bank in order to identify potential problems of information flow (frictions) between the parties involved in the securitization process. Which of the following is a correct combination of a potential friction in the securitization process and an appropriate mechanism to mitigate that friction?

A. Friction between the asset manager and the investor: Adverse selection problem. This problem can be mitigated by the asset manager charging due diligence fees to the investor.
B. Friction between the arranger and the originator: Model error problem. This problem can be mitigated by the arranger providing a credit enhancement to the securitized products with its own funding.
C. Friction between the investor and credit rating agencies: Principal-agent conflict. This problem can be mitigated by requiring credit rating agencies to be paid by originators and not by investors for their rating services.
D. Friction between the servicer and the mortgagor: Moral hazard problem. This problem can be mitigated by requiring the mortgagor to escrow funds for insurance and tax payments.

12. An analyst at an investment bank uses interest-rate trees to forecast short-term interest rates. The analyst applies the following model for estimating monthly changes in a short-term interest rate tree:

$$dr = \lambda(t)*dt + \sigma(t)*dw$$

In this process, $\lambda(t)$ represents the drift in month t, $\sigma(t)$ represents the volatility in month t, dt is the time interval measured in years, and dw is a normally distributed random variable with a mean of zero and a standard deviation of the square root of dt. The analyst uses the following information to make the calculations:

- Current level of short-term interest rate: 3.1%
- Drift in month 1 ($\lambda(1)$): 0.0024
- Drift in month 2 ($\lambda(2)$): 0.0036
- Annualized volatility of the interest rate in month 1 ($\sigma(1)$): 0.0060
- Annualized volatility of the interest rate in month 2 ($\sigma(2)$): 0.0080
- Probability of an upward or downward movement in interest rates: 0.5

What is the volatility component of the change in interest rate from the upper node of month 1 to the upper node of month 2?

A. 23 bps
B. 26 bps
C. 40 bps
D. 45 bps

13. A regulatory analyst at a large multinational bank is examining regulatory requirements the bank must comply with under the Basel Committee's FRTB guidelines. The analyst explores how the FRTB guidelines evolved from the Basel I and Basel II.5 frameworks as well as the instructions for applying the guidelines. Which of the following is correct regarding the FRTB?

A. While Basel I and Basel II.5 allowed market risk to be calculated at the trading desk level, FRTB requires that market risk be calculated on a firm-wide basis.
B. While Basel I and Basel II.5 emphasized the use of a standardized approach to calculating market risk, FRTB encourages each bank to develop and rely on an internal models approach.
C. FRTB standardizes the liquidity horizon used for all risk factors in the market risk capital calculation as 10 days, rather than the different horizons used in Basel I and Basel II.5.
D. FRTB requires that the stressed ES measure be used in determining market risk capital, rather than the VaR and stressed VaR measures that were used in Basel I and Basel II.5, respectively.

14. A CRO of a hedge fund is asking the risk team to develop a term-structure model that is appropriate for fitting interest rates for use in the fund's options pricing practice. The risk team is evaluating several interest rate models that incorporate either time-dependent drift or time-dependent volatility functions. Which of the following is a correct description of the specified model?

A. In the Ho-Lee model, the drift of the interest rate process is assumed to be constant.
B. In the Ho-Lee model, when the short-term rate is above its long-run equilibrium value, the drift is assumed to be negative.
C. In the Cox-Ingersoll-Ross model, the basis-point volatility of the short-term rate is assumed to be proportional to the square root of the rate, and short-term rates cannot be negative.
D. In the Cox-Ingersoll-Ross model, the volatility of the short-term rate is assumed to decline exponentially to a constant long-run level.

15. Due to lack of available investment opportunities in public markets, a pension fund decided to hire an investment consultant to assess the potential for investing in illiquid markets in the US. Which of the following characteristics of illiquid markets in the US should the consultant present to the pension managers?

A. Municipal bonds are usually more liquid than pink-sheet over-the-counter equities.
B. The traditional public, liquid markets of stocks and bonds are larger than the total wealth held in illiquid assets.
C. The share of illiquid assets in institutional portfolios has generally gone up in the past 2 decades.
D. During the 2008-2009 Financial Crisis, liquidity dried up in repo markets but not in commercial paper markets.

16. A portfolio manager at a hedge fund is applying the Merton model to estimate the volatility of a non-dividend-paying firm whose equity shares are held in the fund's portfolio. The manager conducts preliminary analysis on the firm and obtains the following results:

- Value of equity: USD 45 million
- Value of the firm's only debt maturing in 5 years: USD 60 million
- d_1: 3.217790
- d_2: 3.038905

Assuming a constant volatility of firm value, what is the estimate of that volatility?

A. 6%
B. 8%
C. 16%
D. 18%

17. A regional bank wants to improve its operational resilience to help keep pace with emerging best practices in this area. A consultant hired by the bank recommends that it establish a set of impact tolerances to improve its resilience. Which of the following correctly describes a potential benefit to the bank of establishing an impact tolerance?

A. It will enhance the bank's ability to identify and limit concentration risk.

B. It will accurately estimate the severity of a potential disruption to an operational process and the amount of downtime that would result.

C. It will help the bank optimize its allocation of resources to its most important business services.

D. It will prevent failures of critical operational processes and the systems that support these processes.

18. A manager is evaluating the risks of a portfolio of stocks. Currently, the portfolio is valued at CNY 124 million and contains CNY 14 million in stock Y. The annualized standard deviations of returns of the overall portfolio and of stock Y are 16% and 12%, respectively. The correlation of returns between the portfolio and the stock Y is 0.52. Assuming the risk analyst uses a 1-year 95% VaR and the returns are normally distributed, what is the component VaR of stock Y?

A. CNY 0.103 million

B. CNY 1.437 million

C. CNY 2.032 million

D. CNY 3.685 million

19. A fixed-income portfolio analyst is calculating the i-spread on a 10-year, 3.5% fixed-rate USD-denominated bullet bond issued by Bank TBT. The bond is currently rated A-, has no embedded options, makes semi-annual payments, and has 4.5 years remaining to maturity. The analyst obtains the following information:

- Yield to maturity of the bond: 4.67%
- Yield on the nearest-maturity on-the-run Treasury note: 1.15%
- Yield on a 4-year Treasury note: 1.65%
- Yield on a 5-year Treasury note: 2.08%
- The linearly interpolated 4.5-year swap rate: 1.94%
- The z-spread: 316 bps

What is the i-spread on the bond?

A. 151 bps

B. 273 bps

C. 352 bps

D. 431 bps

20. A credit manager at a US-based commercial bank asks a team of risk analysts to examine the risks attributed to a large retail credit portfolio of the bank. The manager instructs the analyst to suggest measures to mitigate the "dark side" of retail credit risk affecting the portfolio. Which of the following would most likely be an effective measure?

A. Focus the extension of credit on low default portfolios such as mortgages or large corporations.

B. Concentrate on expected loss estimation since systematic risk factors such as a real estate crisis or a sharp economic downturn can be diversified away.

C. Monitor the effectiveness of credit risk assessment tools for retail customers and adjust the tools as needed.

D. Use stress tests to analyze the exposure to idiosyncratic risk factors of every single retail credit customer.

21. The CRO at a bank wants to strengthen the bank's capability to defend itself against emerging cyber-threats. To help achieve this goal, the CRO is assessing the current range of practices regarding the sharing of cybersecurity information between different types of institutions, as well as the potential benefits from sharing information. Which of the following statements would be most appropriate for the CRO to make?

A. The sharing of cybersecurity information among banks is less frequently observed and generally considered to be less effective than other cyber-security information-sharing practices.

B. The scope and depth of information-sharing practices among banks may significantly vary between financial markets, depending on the level of trust among participating banks.

C. Information-sharing among different national regulators has evolved significantly over the past several years and is now a widespread practice at a large majority of jurisdictions.

D. Existing peer-sharing mechanisms among banks focus on the exchange of information related to cyber-security incidents, but such information is generally not shared from banks to regulators.

22. A risk manager is training junior risk analysts at an international bank. The manager is instructing them about the difference between repurchase agreements (repos) and reverse repurchase agreements (reverse repos), as well as the relevant market participants. Which of the following is a correct statement for the manager to present to the class?

A. A trader who would like to short a bond could enter into a repo to borrow the bond.

B. Haircuts on collateral are typically charged to those who lend collateral in repo transactions, but margin calls are usually not made.

C. When financing a purchase of securities, financial institutions often sell the repo to avoid putting up full purchase price for the securities.

D. Money market mutual funds tend to enter into a repo to invest short-term liquid instruments.

23. The risk audit committee of an equity mutual fund is reviewing a portfolio construction technique proposed by a new portfolio manager who has recently been allocated capital to manage. The fund typically grants its portfolio managers flexibility in selecting and implementing appropriate portfolio construction procedures but requires that any methodology adopted fulfills key risk control objectives set by the firm. Which of the following portfolio construction techniques and its capability for risk control in portfolio construction is correct?

A. Quadratic programming allows for risk control through parameter estimation but generally requires many more inputs estimated from market data than other portfolio construction techniques do.

B. The screening technique provides superior risk control by concentrating stocks in selected sectors based on expected alpha.

C. When using the stratification technique, risk control is implemented by overweighting the categories with lower risks and underweighting the categories with higher risks.

D. When using the linear programming technique, risk is controlled by selecting the portfolio with the lowest level of active risk.

24. A hedge fund manager is concerned about a potential increase in investor redemptions and wants to assess the effects of such an event on the fund's liquidity. The manager asks a junior analyst to estimate the average number of days required to liquidate certain securities in the fund. The analyst uses the information presented below to make this estimation for four securities:

Security	Market value of security in the fund (CNY million)	Shares of security in the fund	Average daily trading volume of security	Maximum daily volume allowed for liquidation (expressed as a percentage of average daily trading volume)
A	93.00	500,000	522,000	22%
B	173.04	420,000	1,328,000	12%
C	58.88	256,000	710,000	18%
D	28.80	640,000	848,000	20%

Which of the four securities listed above is expected to take the longest to liquidate?

A. Security A

B. Security B

C. Security C

D. Security D

25. A treasurer at a small regional bank is assessing the bank's liquidity position. The treasurer estimates that the following cash inflows and outflows will occur in the next week:

Cash Flows	Amount (USD million)
Deposit withdrawals	30
Deposit inflows	70
Scheduled loan repayments	80
Acceptable loan requests	50
Borrowings from money market	60
Operating expenses	40
Stockholder dividend payments	20
Repayment of bank borrowings	30

Which of the following is the correct amount (in millions of USD), at the week's end, for the bank's net liquidity position?

A. -80
B. -20
C. 40
D. 100

26. A packaging materials manufacturer is considering a project that has an estimated risk-adjusted return on capital (RAROC) of 15%. Suppose that the risk-free interest rate is 3% per year, the expected market rate of return is 11% per year, and the company's equity beta is 1.8. The manufacturer uses the adjusted RAROC metric as the criterion to decide whether or not to accept the project. Which of the following correctly describes the decision the company should make and the rationale for making that decision?

A. Reject the project because the adjusted RAROC is higher than the market expected excess return.
B. Accept the project because the adjusted RAROC is higher than the market expected excess return.
C. Reject the project because the adjusted RAROC is lower than the risk-free interest rate.
D. Accept the project because the adjusted RAROC is lower than the risk-free interest rate.

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

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

28. HIP Bank (HIP) often enters into interest rate swaps with ADB Banking Corporation (ADB) on terms that reflect appropriate counterparty risk. Earlier in the year, HIP and ADB entered into a 3-year swap in which ADB agreed to pay HIP a fixed rate of 5% in return for 6-month LIBOR plus a spread. Since the swap was entered into, both banks were downgraded. As a result of the ratings changes, the credit spread for HIP has increased from 36 bps to 144 bps, while the credit spread for ADB has increased from 114 bps to 156 bps. Assuming no change in the LIBOR curve, if an identical 3-year swap was entered into today, which of the following is the most likely to be correct?

A. Since HIP's spread increased more than ADB's spread, HIP's DVA will increase and ADB's DVA will decrease.

B. Since HIP's spread increased more than ADB's spread, HIP's CVA will increase and ADB's CVA will decrease.

C. Since both banks' spreads increased, the CVA on both sides of the contract will be higher.

D. Since both banks' spreads increased, the DVA on both sides of the contract will be lower.

29. A risk analyst estimates that the hazard rate for a company is 0.12 per year. Assuming a constant hazard rate model, what is the probability that the company will survive in the first year and then default before the end of the second year?

A. 8.9%

B. 10.0%

C. 11.3%

D. 21.3%

30. A senior risk analyst at a large investment bank is proposing to the CRO a plan to improve the efficiency of the bank's risk measurement system. The analyst suggests simplifying the bank's portfolio VaR estimation process by mapping the bank's large number of trading positions to a small number of elementary risk factors. Which of the following is the most appropriate way of mapping the given position?

A. Mapping USD/EUR forward contracts to the USD/EUR spot exchange rate

B. Mapping each position in a corporate bond portfolio to the bond with the closest maturity among a set of government bonds

C. Mapping zero-coupon government bonds to government bonds paying regular coupons

D. Mapping zero-coupon government bonds to government bonds paying regular coupons

31. An analyst at bank LKS has been asked to validate the bank's VaR model through backtesting. The analyst uses two sets of returns data to generate results of predicted and actual losses that can be compared in the validation process. Which of the following correctly describes the two most appropriate sets of returns data to use in backtesting?

A. The cleaned returns, which are the actual returns minus any profit and loss from intraday trades, and the actual returns, which correspond to the total returns on the bank's trading portfolio

B. The actual returns, which correspond to the total return on the bank's trading portfolio, and the hypothetical returns, which represent the returns obtained from freezing the starting positions in the bank's trading portfolio

C. The hypothetical returns, which represent the returns obtained from freezing the starting positions in the bank's trading portfolio, and the cleaned returns, which are the actual returns minus any profit and loss from intraday trades

D. The trading returns, which are the actual returns minus any fees and commissions, and the hypothetical returns, which represent the actual returns obtained from freezing the starting positions in the bank's trading portfolio

32. A financial analyst is pricing a 5-year call option on a 5-year Treasury note using a successfully validated pricing model. Current interest rate volatility is high, and the analyst is concerned about the effect this may have on short-term rates when pricing the option. Which of the following actions would best address the potential for negative short-term interest rates to arise in the model?

A. When short-term rates are negative, the financial analyst adjusts the risk-neutral probabilities.

B. When short-term rates are negative, the financial analyst increases the volatility.

C. When short-term rates are negative, the financial analyst sets the rate to zero.

D. When short-term rates are negative, the financial analyst sets the mean-reverting parameter to 1.

33. A risk analyst at an investment bank is evaluating the bank's risk measurement process. The bank currently uses VaR as its primary risk measure, but the analyst believes ES may be a better measure to use during periods of market turmoil. When comparing VaR and ES, which of the following statements is correct?

A. For the same confidence level, ES is always greater than VaR.

B. If a VaR backtest at a specified confidence level is accepted, then the corresponding ES will always be accepted.

C. While VaR ensures that the estimate of portfolio risk is less than or equal to the sum of the risks of that portfolio's positions, ES does not.

D. While ES is more complicated to calculate than VaR, it is easier to backtest than VaR.

34. A derivative trading desk at a bank decides that its existing VaR model, which has been used broadly across the firm for several years, is too conservative. The existing VaR model uses a historical simulation over a 3-year look-back period, weighting each day equally. A quantitative analyst in the group quickly develops a new VaR model, which uses the delta-normal approach. The new model uses volatilities and correlations estimated over the past 4 years using the RiskMetrics EWMA method.

For testing purposes, the new model is used in parallel with the existing model for 6 weeks to estimate the 1-day 99% VaR. After 6 weeks, the new VaR model has no exceedances despite consistently estimating VaR to be considerably lower than the existing model's estimates. The analyst argues that the lack of exceedances shows that the new model is unbiased and pressures the bank's model evaluation team to agree. Following an overnight examination of the new model by one junior analyst, instead of the customary evaluation that takes several weeks and involves a senior member of the team, the model evaluation team agrees to accept the new model for use by the desk.

Which of the following statements is a correct conclusion for this replacement?

A. Delta-normal VaR is more appropriate than historical simulation VaR for assets with non-linear payoffs.

B. Changing the look-back period and weighting scheme from 3 years, equally weighted, to 4 years, exponentially weighted, will understate the risk in the portfolio.

C. Overnight examination by the junior analyst increased the desk's exposure to model risk due to the potential for incorrect calibration and programming errors.

D. A 99% VaR model that generates no exceedances in 6 weeks is necessarily conservative.

35. The senior management team of a small regional bank has established a committee to review procedures and implement best practices related to entering into significant contracts with third-party vendors. The committee is reviewing one proposed relationship with a third-party vendor who would have a significant responsibility for marketing the bank's financial products to potential customers. In establishing policies to reduce the operational risk associated with this potential vendor contract, which of the following recommendations would be most appropriate?

A. The bank should review all third-party audit reports of the vendor that are publicly available.

B. The bank should ensure that the vendor's sales representatives are compensated mainly with commissions from the sale of the bank's products.

C. The bank should prevent the third-party vendor from having access to any of its critical processes.

D. The bank should be responsible for developing the vendor's contingency planning process to mitigate risk exposure to the vendor.

36. The Basel Committee recommends that banks use a set of early warning indicators to identify emerging risks and potential vulnerabilities in their liquidity position. Which of the following is an early warning indicator of a potential liquidity problem?

A. Credit rating upgrade
B. Increased asset diversification
C. Rapid growth in the leverage ratio with significant dependence on short-term repo financing
D. Decreased collateral haircuts applied to the bank's collateralized exposures

37. Large dealer banks have often financed significant fractions of their assets using short-term (overnight) repurchase agreements in which creditors hold bank securities as collateral against default losses. The table below shows the quarter-end financing of four A-rated broker-dealer banks. All values are in USD billion.

Financial instruments	Bank P	Bank Q	Bank R	Bank S
Owned	656	750	339	835
Pledged as collateral	258	472	139	209
Not pledged	398	278	200	626

In the event that repo creditors become equally nervous about each bank's solvency, which bank is most vulnerable to a liquidity crisis?

A. Bank P
B. Bank Q
C. Bank R
D. Bank S

38. During a training seminar, a supervisor at Firm W discusses different types of operational risk that the firm may face, which could be in the short-term or over a longer-term period. Which of the following is an example of a loss caused by an operational risk of Firm W?

A. After a surprise announcement by the central bank that interest rates would increase, bond prices fall and Firm W incurs a significant loss on its bond portfolio.
B. The data capture system of Firm W fails to capture the correct market rates causing derivative trades to be transacted at incorrect prices, resulting in significant losses.
C. As a result of an increase in commodity prices, the share price of a company that Firm W invested in falls significantly, causing major investment losses.
D. A counterparty of Firm W fails to settle its debt to Firm W, and in doing this, it is in breach of a legal agreement to pay for services rendered.

39. A bank owned several retail branch buildings that were destroyed in a hurricane. A financial analyst at the bank wants to determine the correct costs to include in reporting this loss in its operational risk event database. Which of the following costs associated with this loss should be included in the operational loss report?

A. Costs of insurance premiums paid to insure the buildings before the storm took place
B. A provision for the estimated opportunity costs of lost banking business at the affected branches
C. Legal costs paid to obtain construction permits to rebuild the destroyed branch buildings
D. Costs of a program to train branch managers on ways to prepare buildings to mitigate potential damage from future hurricanes

40. A risk analyst is implementing an enterprise risk management system at a bank. During the process, the analyst takes an inventory of risks faced by the bank and categorizes these risks as market, credit, or operational risks. Which of the following observations of the bank's data should be considered unexpected if compared to similar industry data?

A. The operational risk loss distribution has many small losses, and therefore a relatively low mode.
B. The operational risk loss distribution is symmetric and fat-tailed.
C. The credit risk distribution is asymmetric and fat-tailed.
D. The market risk distribution is symmetric.

41. A regional commercial bank is considering a 1-year loan to be fully funded by deposits, with the following parameters:

- Loan amount: JPY 4.2 billion
- Average annual interest rate paid on deposits: 0.4%
- Annual interest rate received on loan: 3.2%
- Expected loss: 2.0% of face value of loan
- Annual operating costs: 0.5% of face value of loan
- Economic capital required to support the loan: 10.0%
- Average pre-tax return on economic capital: 1.4%
- Effective tax rate: 38%
- Other transfer costs: JPY 0

What is the after-tax RAROC for this loan?

A. 0.27%
B. 2.73%
C. 4.40%
D. 10.73%

42. A bank is using the VaR and stressed VaR market risk framework in line with the Basel II.5 guidelines. The bank's internal models for market risk have generated the following risk measures (in USD million) for the current trading book positions:

Confidence level	Latest available 10-day VaR	Latest available 10-day stressed VaR	Average 10-day VaR of previous 60 days	Average 10-day stressed VaR of previous 60 days
95.0%	238	484	252	546
99.0%	451	995	413	1,106
99.9%	578	1,281	528	1,372

Assuming the supervisory authority has set the multiplication factors for both the VaR and the stressed VaR values to 3, what is the correct capital requirement for general market risk for the bank under Basel II.5?

A. USD 1,248 million
B. USD 1,533 million
C. USD 4,557 million
D. USD 4,799 million

43. Company PQR has an outstanding zero-coupon bond with 1 year remaining to maturity. The bond, the company's only debt, has a face value of USD 2,000,000 and a recovery rate of 0% in the event of default. The bond is currently trading at 75% of face value. Assuming the excess spread only captures credit risk and that the continuously-compounded risk-free rate is 3% per year, and using risk-neutral binomial tree methodology, what is the approximate risk-neutral 1-year probability of default of Company PQR?

A. 13.3%
B. 16.5%
C. 19.2%
D. 22.7%

44. As part of a broader assessment of migration risk, a risk analyst at a rating agency examines the observed defaults of a given rating class of corporate issuers. The rating class contained 348 names (number of issuers) at the end of 2016, which was the time of origination. The number of issuers that have not defaulted over the past 3 years is shown in the table below:

Year	Number of non-defaulted names at end of year
2016	348
2017	339
2018	333
2019	329

Assuming no new issuers were added to the rating class throughout the holding period, what is the estimate of the 1-year marginal probability of default in the year 2019?

A. 1.15%

B. 1.20%

C. 1.72%

D. 1.77%

45. A financial institution has four open derivative positions with an investment company. A description of the positions and their current market values are displayed in the table below:

Position	Exposure (USD)
Long swaptions	32 million
Long credit default swaps	12 million
Long currency derivatives	-16 million
Long futures contracts	-8 million

If the investment company defaults, what would be the loss to the financial institution if netting is used compared to the loss if netting is not used?

A. Loss of USD 20 million if netting is used; loss of USD 24 million if netting is not used

B. Loss of USD 20 million if netting is used; loss of USD 44 million if netting is not used

C. Loss of USD 24 million if netting is used; loss of USD 32 million if netting is not used

D. Loss of USD 24 million if netting is used; loss of USD 44 million if netting is not used

46. A derivative trading firm sells a European-style call option on stock JKJ with a time to expiration of 9 months, a strike price of EUR 45, an underlying asset price of EUR 67, and implied annual volatility of 27%. The annual risk-free interest rate is 2.5%. What is the trading firm's counterparty credit exposure from this transaction?

A. EUR 0

B. EUR 9.45

C. EUR 19.63

D. EUR 22.00

47. A financial firm has sold default protection on the most senior tranche of a CDO. If the default correlation between assets held in the CDO decreases sharply from the correlation used in pricing the CDO tranches, assuming everything else is unchanged, how will the position of the financial firm be impacted?

A. It will either increase or decrease, depending on the pricing model used and the market conditions.
B. It will gain significant value, since the probability of exercising the protection falls.
C. It will lose significant value, since the protection will gain value.
D. It will neither gain nor lose value, since only expected default losses matter and correlation does not affect expected default losses.

48. A risk analyst constructs a binomial interest rate tree by using the Ho-Lee model. The time step is monthly and the annualized drift is 80 bps in the first month and 120 bps in the second month. Assuming the current annualized short-term rate is 3.2% and the annual basis point-volatility is 2.1%, what is the interest rate in the lowest node after 2 months?

A. 1.82%
B. 2.15%
C. 2.76%
D. 3.03%

49. A junior risk analyst at a consulting firm is reviewing the operational arrangements of bilateral netting and central clearing of derivative trades. The analyst examines the following bilateral trades of three firms:

- Firm 1's exposure to Firm 2: AUD 90 million
- Firm 2's exposure to Firm 1: AUD 60 million
- Firm 1's exposure to Firm 3: AUD 12 million
- Firm 3's exposure to Firm 1: AUD 70 million
- Firm 2's exposure to Firm 3: AUD 57 million
- Firm 3's exposure to Firm 2: AUD 0 million

Which of the following statements is correct?

A. Under bilateral netting, Firm 1's net exposure is AUD 28 million.
B. Under bilateral netting, Firm 2's net exposure is AUD 27 million.
C. Under central clearing, Firm 3's net exposure is AUD 0 million.
D. Under central clearing, the CCP's net exposure is AUD 28 million.

50. A credit analyst is evaluating the liquidity of a small regional bank while preparing a report for a credit committee meeting. With quarterly financial statements, the analyst calculates some relevant liquidity indicators over the past three years. Which of the following trends over this period should the analyst be most concerned about in the credit risk report?

A. The bank's average net federal funds and repurchase agreements position has been increasing.
B. The bank's capacity ratio has been increasing.
C. The bank's pledged securities ratio has been decreasing.
D. The bank's loan commitments ratio has been decreasing.

51. A risk analyst is examining a firm's foreign currency option pricing assumptions. The implied volatility is relatively low for an at-the-money option and it becomes progressively higher as the option moves either in-the-money or out-of-the-money. How does the distribution of option prices on this foreign currency implied by the Black-Scholes-Merton model compare to the lognormal distribution with the same mean and standard deviation?

A. It has a heavier left tail and a less heavy right tail.
B. It has a heavier left tail and a heavier right tail.
C. It has a less heavy left tail and a heavier right tail.
D. It has a less heavy left tail and a less heavy right tail.

52. A wealth management firm has JPY 72 billion in assets under management. The portfolio manager computes the daily VaR at various confidence levels as follows:

Confidence Level	VaR (USD)
95.0%	332,760,000
95.5%	336,292,500
96.0%	340,095,000
96.5%	350,332,500
97.0%	359,107,500
97.5%	367,882,500
98.0%	378,412,500
98.5%	392,452,500
99.0%	410,880,000
99.5%	439,252,500

What is the closest estimate of the daily ES at the 97.5% confidence level?

A. JPY 398 million
B. JPY 400 million
C. JPY 405 million
D. JPY 497 million

53. A newly hired risk analyst at an investment bank is assisting in backtesting the bank's VaR model. Currently, the 1-day VaR is estimated at the 95% confidence level but the bank is considering a change to estimating 1-day VaR at the 99% confidence level, as recommended in the Basel framework. Which of the following statements regarding this change is correct?

A. The decision to accept or reject a VaR model based on backtesting results at the two-tailed 95% confidence level is less reliable using a 99% VaR model than using a 95% VaR model.
B. The 95% VaR model is less likely to be rejected using backtesting than the 99% VaR model.
C. When backtesting using a two-tailed 90% confidence level test, there is a smaller probability of incorrectly rejecting a 95% VaR model than a 99% VaR model.
D. Using a 99% VaR model will lower the probability of committing both type 1 and type 2 errors.

54. A risk manager at a fixed-income hedge fund is evaluating ways to improve the fund's ability to model interest rate term structures. The manager would like to adopt a model that is flexible enough to incorporate mean reversion as well as a risk premium and considers the Vasicek model for this purpose. Which of the following is correct about the Vasicek model?

A. It incorporates the mean reversion feature and its drift is always zero.

B. It incorporates the mean reversion feature and models the risk premium as a component of a constant or changing drift.

C. It cannot incorporate risk premium and its drift is always zero.

D. It cannot capture the mean reversion feature but can be used to model the time-varying risk premium.

55. A newly hired risk analyst at a large investment bank is examining how financial correlation risk affects the bank's portfolios. The bank holds portfolios consisting of different types of assets and enters into various hedging contracts with multiple counterparties. Which of the following statements would the analyst be correct to make?

A. The buyer of a CDS faces wrong-way risk when there is a positive default correlation between the reference asset and the CDS counterparty.

B. The risk-adjusted return of a portfolio typically increases when correlations of assets in the portfolio increase.

C. Dynamic correlation risk in a portfolio of pairs trades is most appropriately estimated using Gaussian copulas.

D. Correlation risk is highest during periods of relatively benign market movements when correlations are difficult to predict.

56. A risk committee of the board of company ABC is discussing the difference between pricing deep out-of-the-money call options on ABC stock and pricing deep out-of-the-money call options on the USD/GBP foreign exchange (FX) rate using the Black-Scholes-Merton model. The committee considers pricing each of these two options based on two distinct probability distributions of underlying asset prices at the option expiration date: a lognormal probability distribution, and an implied risk-neutral probability distribution obtained from the volatility smile for each aforementioned option of the same maturity and the same moneyness. If the implied risk-neutral probability distribution is used instead of the lognormal distribution, which of the following is correct?

A. The price of the option on ABC stock would be relatively high and the price of the option on USD/GBP FX rate would be relatively low compared to those computed from the lognormal counterparts.

B. The price of the option on ABC stock would be relatively low and the price of the option on USD/GBD FX rate would be relatively high compared to those computed from the lognormal counterparts.

C. The price of the option on ABC stock would be relatively low and the price of the option on USD/GBD FX rate would be relatively low compared to those computed from the lognormal counterparts.

D. The price of the option on ABC stock would be relatively high and the price of the option on USD/GBD FX rate would be relatively high compared to those computed from the lognormal counterparts.

57. The CRO of a regional bank expresses concern in a risk team meeting that the bank's internal risk models are not adequate in assessing potential random extreme losses. A risk analyst suggests that implementing a model based on extreme value theory (EVT) could address this concern. Which of the following is correct when applying EVT and examining distributions of losses exceeding a threshold value?

A. As the threshold value is increased, the distribution of losses over a fixed threshold value converges to a generalized Pareto distribution.

B. If the tail parameter value of the generalized extreme-value (GEV) distribution goes to infinity, then the GEV essentially becomes a normal distribution.

C. To apply EVT, the underlying loss distribution must be either normal or lognormal.

D. The number of exceedances decreases as the threshold value decreases, which causes the reliability of the parameter estimates to increase.

58. A regulatory analyst at an investment bank is reviewing the Basel Committee rules for backtesting VaR models. The analyst notes that under the Basel framework, a penalty can be given to banks that have more than four exceptions to their 1-day 99% VaR over the last 250 trading days. Which of the following scenarios is most likely to result in a penalty?

A. A large move in interest rates occurs in conjunction with a small move in correlations.
B. The bank's model calculates interest rate risk based on the median duration of the bonds in the portfolio.
C. A sudden market crisis in an emerging market, which leads to losses in the equity positions in that country.
D. A sudden devastating earthquake that causes major losses in the bank's key area of operation.

59. A fund manager owns a portfolio of options on TUV, a non-dividend-paying stock. The portfolio is made up of 5,000 deep in-the-money call options on TUV and 20,000 deep out-of-the-money call options on TUV. The portfolio also contains 10,000 forward contracts on TUV. Currently, TUV is trading at USD 52. Assuming 252 trading days in a year, the volatility of TUV is 12% per year, and that each of the option and forward contracts is on one share of TUV, which of the following amounts would be closest to the 1-day 99% VaR of the portfolio?

A. USD 11,557
B. USD 12,627
C. USD 13,715
D. USD 32,000

60. A risk analyst at a hedge fund is evaluating the risk of the fund's portfolio of illiquid assets, whose returns are reported monthly. The analyst is concerned that certain biases resulting from the returns data can make the fund's risk profile appear misleading. In particular, the fund may appear to have low systematic risk when it actually does not. Which of the following represents an appropriate method of correcting this bias?

A. Account for negative serial correlation of returns when extrapolating risk to longer time horizons.
B. Account for positive serial correlation of returns by aggregating the data.
C. Use regressions with fewer lags of the market factors and sum the coefficients across lags.
D. Use regressions with additional lags of the market factors and sum the coefficients across lags.

61. A fund of funds (FOF) manager is conducting a performance attribution analysis for a portfolio consisting of equity and fixed-income securities to evaluate the effects of the portfolio manager's asset allocation and security selection decisions. The FOF manager uses the information presented below:

Asset class	Portfolio weight	Benchmark weight	Portfolio return	Benchmark return
Equity	58%	50%	8%	11%
Fixed Income	42%	50%	6%	7%

What is the contribution of the portfolio manager's asset allocation decision to the portfolio's overall excess return?

A. -2.16%
B. -1.84%
C. -0.16%
D. 0.32%

62. A pension fund manager is planning to invest a portion of the fund's portfolio into hedge funds. The manager is concerned about the potential asymmetry in risk sharing that may occur with hedge fund investments. What action should the pension fund manager take to mitigate this risk?

A. Allocate the money across several different hedge fund strategies to diversify away the asymmetry in risk sharing.
B. Choose a reputable hedge fund manager that manages investments for other major pension funds.
C. Ensure that the hedge fund managers have a sizable amount of their own wealth invested in their fund.
D. Require the hedge fund to provide a daily position report to better monitor the potential asymmetry in risk sharing.

63. A risk manager at a bank is seeking to better understand recent liquidity risk failures. Several real-life cases are reviewed. Which of the following lessons would be best illustrated by the case of Metallgesellschaft in 1993?

A. Negative public perception of emergency borrowing from the central bank can cause a bank run.
B. Positive feedback trading in illiquid instruments can cause excessive losses.
C. Hedging liabilities by rolling forward futures contracts may create cash flow mismatches.
D. Futures provide a better effective hedge for hedging commodities exposure than forwards.

64. A risk analyst at an investment bank is conducting performance analyses of hedge funds and real estate funds. The analyst notes the following two issues regarding the funds' annual performance data:

- Whenever a hedge fund stops reporting its performance, it is removed from the database of hedge funds.
- Assets owned by the real estate funds are valued only once a year due to infrequent trading.

Which of the following best describes the impacts of using the data with the aforementioned issues on the results of the performance analyses?

A. The average Sharpe ratio of hedge funds is understated and the average Sharpe ratio of real estate funds is overstated.
B. The average Sharpe ratio of hedge funds is overstated and the average Sharpe ratio of real estate funds is also overstated.
C. The average volatility of hedge funds is overstated and the average volatility of real estate funds is also overstated.
D. The average volatility of hedge funds is overstated and the average volatility of real estate funds is understated.

65. A money manager who has recently received a small amount of new capital is planning to invest this capital into an existing fund, which is benchmarked to an index. Rather than investing in a new asset to be included in the fund, the manager is planning to increase the holding of one of the fund's four assets. Information about these assets, and their performances during the most recent evaluation period, are given below:

Asset	Portfolio weight	Return	Volatility of return	Beta to the portfolio
BDE	0.35	14%	19%	1.20
JKL	0.30	13%	18%	0.90
MNO	0.25	13%	16%	1.00
STU	0.10	10%	10%	0.80

The portfolio manager wants to select the asset that has the lowest marginal VaR as long as its Jensen's alpha is greater than or equal to the market risk premium. Assuming the risk-free interest rate is 3% and the market return is 8%,which asset should the portfolio manager select?

A. Asset BDE
B. Asset JKL
C. Asset MNO
D. Asset STU

66. A manager of collateralized loan obligations (CLOs) is reviewing the performance of a CLO that has a pool of 50 identical loans, each priced at its par value of GBP 1 million. The underlying loan assets are floating-rate obligations that pay a fixed spread of 150 bps over LIBOR. The coupons and interest payments on the following liabilities are made on an annual basis and occur at the end of the year:

Liabilities	Amount (GBP)	Coupon
Senior debt	37,500,000	LIBOR + 45 bps
Mezzanine debt	10,000,000	LIBOR + 300 bps
Equity	2,500,000	

The manager reports that the CLO initially has no overcollateralization, and the annual excess spread flowing into the overcollateralization account has a limit of GBD 250,000. Suppose the LIBOR curve remains flat at 4% in the first year, and assuming no defaults in the collateral pool and no management and transaction fees, what are the correct amounts that the manager would post to the overcollateralization account and to the equity tranche after the first year?

	Overcollateralization Account	Equity Tranche
A.	GBP 0	GBP 0
B.	GBP 0	GBP 381,250
C.	GBP 250,000	GBP 131,250
D.	GBP 381,250	GBP 0

67. The board of directors of a manufacturing company is reviewing the company's contribution to its defined benefit pension plan. Part of the review focuses on assessing different elements of the plan's funding risk. Which of the following statements about funding risk is correct?

A. Decreases in interest rates always reduce funding risk.

B. Funding risk represents the true long-term risk to the plan sponsor.

C. Funding risk is effectively transferred to the employees of the manufacturing company.

D. As the time horizon for expected payouts gets longer, the plan's funding risk decreases.

68. A portfolio manager at an investment firm manages a number of accounts for multiple clients. The manager is analyzing the dispersion that occurs among these accounts, with dispersion defined as the difference between the maximum and minimum return for the accounts. The manager explores the various drivers of dispersion and deliberates over how dispersion can be minimized. Which of the following conclusions is correct for the manager to reach?

A. Dual-benchmark optimization can reduce dispersion and help achieve higher average returns.

B. A portfolio manager's tracking error and dispersion tend to be proportional to each other over time.

C. Dispersion is always client-driven since it refers to the variance in the performances of client portfolios managed by the same manager.

D. Portfolio managers can control dispersion and should aim to reduce any existing dispersion to zero.

69. An external auditor is reviewing the modeling processes used by a US-based bank to model operational losses as part of the bank's capital planning process. Using guidelines set by the Federal Reserve with respect to capital planning, which of the following processes or assumptions would the auditor find most appropriate?

A. Assuming a high positive correlation between operational loss severity and equity index movements during normal market conditions

B. Using a net charge-off model to predict shorter-term credit losses and a roll-rate model to predict losses over a longer time horizon

C. Modeling operational losses by projecting an annual loss estimate and then evenly distributing the losses across the four quarters of the year

D. Incorporating forward-looking factors and idiosyncratic risk exposures into stressed operational loss estimates

70. A bank has implemented a VaR model for its portfolio of commodity derivatives. The bank's risk management unit would like to establish a process for the validation of this new model. Which of the following actions would be most appropriate for a validator to take as part of this process?

A. Validate the model with the help of the model development team to leverage the team's expertise and experience with the model.
B. Review the input parameters and analyze the operational processes and information technology systems that generate the model output.
C. Ensure that traders have access to an independent market and risk data source so that they can determine VaR limits to be used in the model.
D. Ensure that modeling assumptions remain constant over extended periods of time so that model output can be successfully backtested.

71. An internal auditor at a large bank is reviewing the bank's economic capital framework to ensure that it meets best practices. The auditor identifies deficiencies in the bank's governance framework as well as the process used to determine the firm-wide economic capital and asks the CRO to suggest corrective actions that conform with best practices. Which of the following actions should the CRO recommend?

A. Require business unit managers to challenge the assumptions for their unit's capital model before providing final approval.
B. Calculate the bank's aggregate economic capital by summing its exposures for different risk types.
C. Incorporate a set of escalation procedures into the bank's contingency plan for its economic capital policy.
D. Discourage the use of macroeconomic scenarios developed by third-party vendors to stress test economic capital models.

72. A CFO has asked for a review of the bank's contingency funding plan and would like to ensure that key components are incorporated. Which of the following is a correct statement regarding the key components to be found in an effective contingency funding plan (CFP)?

A. Liquidity stress testing scenarios are designed to focus solely on institution-specific risks and address both market (asset) liquidity and funding liquidity, over short-term and prolonged stress periods.
B. Institutions should align their CFP stress scenarios to those in its liquidity stress testing framework, as well as to other frameworks such as recovery and resolution plans.
C. Identification of contingent actions such as maintaining investment strategies to reinvest maturing securities in order to maximize and maintain bank profitability during stressed periods.
D. The liquidity crisis team may invoke the CFP based on a review of the markets, industry, bank-specific conditions, and liquidity stress testing results.

73. Two financial institutions are facing different funding issues. Bank A, a mid-sized regional bank is concerned that it has a shortfall in legal reserves for the day and is seeking an alternative to address this shortfall. Bank B, a small community bank, on the other hand, has recently experienced a much greater than anticipated shortfall in long term certificates of deposit (CD) renewals due to fierce local competition for retail deposits. Bank B has traditionally used stable CDs to fund its home mortgage portfolio. What is the most appropriate funding response of each of these two institutions considering timing and the availability of non-deposit funds?

A. Bank A should borrow from the wholesale deposit market and Bank B should fund itself through the Eurocurrency deposit market.

B. Bank A should fund itself through the commercial paper (CP) market and Bank B should borrow from the Federal funds market.

C. Bank A should borrow from the Federal funds market and Bank B should borrow from the Federal Home Loan Banks.

D. Bank A should issue debentures and Bank B should fund itself through the CP market.

74. A bank buys a bond on its coupon payment date. Three months later, in order to generate immediate liquidity, the bank decides to repo the bond. Details of the bond and repo transaction are as follows:

Notional (USD)	100,000
Coupon (semi-annual)	5%
Current bond price (USD)	98
Repo haircut	5%
Repo interest rate	3%

If the repo contract expires 6 months from now, what is the bank's expected cash outflow at the end of the repo transaction?

A. USD 94,497

B. USD 95,702

C. USD 97,630

D. USD 100,739

75. A large bank is reviewing its processes and procedures to manage operational risk in accordance with best practices established by the Basel Committee. In implementing the three lines of defense model, which of the following statements is correct?

A. The internal audit function should serve as the first line of defense and continually validate operational procedures used by the business lines.

B. Business line managers, as part of the first line of defense, should provide a credible challenge to the internal audit function.

C. The corporate operational risk function, as part of the second line of defense, should challenge risk inputs from business line managers.

D. The corporate operational risk function should serve as the third line of defense and validate model assumptions made by senior management.

76. A CRO at an investment bank has asked the risk department to evaluate the bank's derivative position with a counterparty over a 3-year period. The risk department assumes that the counterparty's default probability follows a constant hazard rate process. The table below presents trade and forecast data on the CDS spread, the expected exposure, and the recovery rate of the counterparty:

	Year 1	**Year 2**	**Year 3**
Expected positive exposure (AUD million)	14	14	14
CDS spread (bps)	200	300	400
Recovery rate (%)	80	70	60

Additionally, the CRO has presented the risk team with the following set of assumptions to use in conducting the analysis:

- The investment bank and the counterparty have signed a credit support annex to cover this exposure, which requires collateral posting of AUD 11 million.
- The current risk-free rate of interest is 3% and the term structure of interest rates remains flat over the 3-yearhorizon.
- The collateral and the expected positive exposure values remain stable as projected over the 3-year life of the contract.
- The expected positive exposure and the collateral are assessed by using the same discount factors.
- The probability of default of the bank is 0% per year.

Given the information and the assumptions above, what is the correct estimate of the unilateral CVA for this position?

A. AUD 0.214 million

B. AUD 0.253 million

C. AUD 0.520 million

D. AUD 0.998 million

77. The board of directors at a large bank wants to improve the bank's practices for managing money laundering and financial terrorism (ML/FT) risk. The risk committee of the bank meets to discuss ways to achieve this objective that conform to best practices. Which of the following actions would be most appropriate for the bank to recommend?

A. Require the bank's business units to screen potential employees as part of the first line of defense in managing ML/FT risk.

B. Establish a threshold transaction value and review all transactions above this threshold for evidence of ML/FT.

C. Exclude politically exposed persons (PEPs) from screening for ML/FT risk due to their much lower ML/FT risk.

D. Give the compliance and legal functions the primary responsibility for managing ML/FT risk.

78. A risk analyst evaluates the likelihood of default in a credit portfolio, which consists of two credit assets. The credits are rated BBB and BB with probability of default of 3.5% and 4.2% for next year, respectively. The analyst also reports that the joint default probability of the two credits is 1.0% for the same horizon. What is the implied default correlation for the credit portfolio for next year?

A. 7.7%

B. 8.7%

C. 23.1%

D. 31.1%

79. An investment management firm is in the process of strengthening its internal control environment and forms an independent risk management unit (RMU). An analyst at the firm is asked to prepare a summary document describing the responsibilities of the new unit. While documenting the duties of the RMU, which of the following actions would be appropriate for the analyst to include?

A. Identify appropriate software and research reports to help make trading decisions.

B. Generate VaR levels that are consistent with the targets set in the risk plan.

C. Oversee model analysts while they establish asset valuation models.

D. Assess the quality of models used to measure risk.

80. A financial institution has a two-way credit support annex (CSA) with a counterparty covering a portfolio valued at JPY 400 million. The margining terms of the collateralized portfolio include a threshold of JPY 180 million, a minimum transfer amount of JPY 30 million, and a margin period of risk of 10 days. Which of the following is correct?

A. A lower threshold value implies that a larger portion of exposure is protected by collateral.

B. A shorter margin period of risk implies that a smaller portion of exposure is protected by collateral.

C. A lower independent amount implies that a larger portion of exposure is protected by collateral.

D. The protection from collateral specified in the CSA is uniform throughout the life of the exposure profile.

2022 FRM Part II Practice Exam – Answer Key

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

1. A global bank possesses subsidiaries with banking licenses in various countries, including Singapore, Australia, and UK. Regulators in these countries have recently announced their intention to examine the bank's risk culture framework and its policies regarding conduct and culture. According to best practices described in recent publications, which of the following actions would the regulators most likely perform?

A. Increase the bank's operational risk capital requirements.
B. Review the bank's accountability standards for its senior management.
C. Require that the bank implement quantitative approaches to model conduct and culture.
D. Recommend that the bank increase the proportion of incentive compensation for its traders and investment bankers.

Correct Answer: B

Explanation: B is correct. The regulators would be most likely to review the bank's accountability standards for its senior managers to ensure the managers behave in a manner that promotes proper conduct.

A is incorrect. Conduct and culture are currently not directly addressed by regulatory risk capital requirements. While poor conduct and culture increase the chance for operational losses, current Basel operational risk capital requirements respond to net income and sometimes to reported, not expected, operational losses.

C is incorrect. Traditional, quantitative approaches cannot be easily applied.

D is incorrect. Increasing the proportion of incentive compensation could promote poorer conduct and a less conservative risk culture, therefore increasing the bank's risk exposure.

Section: Operational Risk and Resiliency

Reference: Banking Conduct and Culture: A Permanent Mindset Change, G30 Working Group, 2018

Learning Objective: Assess the role of regulators in encouraging strong conduct and culture at banks, and provide examples of regulatory initiatives in this area. The reference does not change.

2. A risk manager is estimating the market risk of a portfolio using both the arithmetic returns with normal distribution assumptions and the geometric returns with lognormal distribution assumptions. The manager gathers the following data on the portfolio:

- Annualized average of arithmetic returns: 16%
- Annualized standard deviation of arithmetic returns: 27%
- Annualized average of geometric returns: 13%
- Annualized standard deviation of geometric returns: 29%
- Current portfolio value: EUR 5,200,000
- Trading days in a year: 252

Assuming both daily arithmetic returns and daily geometric returns are serially independent, which of the following statements is correct?

A. The 1-day normal 95% VaR is equal to 1.63% and the 1-day lognormal 95% VaR is equal to 1.76%.
B. The 1-day normal 95% VaR is equal to 2.69% and the 1-day lognormal 95% VaR is equal to 2.88%.
C. The 1-day normal 95% VaR is equal to 2.74% and the 1-day lognormal 95% VaR is equal to 2.92%.
D. The 1-day normal 95% VaR is equal to 3.26% and the 1-day lognormal 95% VaR is equal to 3.48%.

Correct Answer: C

Explanation: 1-day normal 95% VaR = -[(0.16/252)-1.645*0.27/sqrt(252)] = 2.74%

1-day lognormal 95% VaR = 1-exp[(0.13/252)-0.29*1.645/sqrt(252)] = 2.92%

Section: Market Risk Measurement and Management

Reference: Kevin Dowd, Measuring Market Risk, 2nd Edition (West Sussex, England: John Wiley & Sons, 2005). Chapter 3 - Estimating Market Risk Measures: An Introduction and Overview

Learning Objective: Estimate VaR using a parametric approach for both normal and lognormal return distributions.

3. A credit manager in the counterparty risk division of a large bank uses a simplified version of the Merton model to monitor the relative vulnerability of its largest counterparties to changes in their valuation and financial conditions. To assess the risk of default of three particular counterparties, the manager calculates the distance to default assuming a 1-year horizon (t=1). The counterparties: Company P, Company Q, and Company R, belong to the same industry, and are non-dividend-paying firms. Selected information on the companies is provided in the table below:

Company	P	Q	R
Market value of assets (EUR million)	100	150	250
Face value of debt (EUR million)	60	100	160
Annual volatility of asset values	10.0%	7.0%	8.0%

Using the information above with the assumption that a zero-coupon bond maturing in 1 year is the only liability for each company, and the approximation formula of the distance to default, what is the correct ranking of the counterparties, from most likely to least likely to default?

A. P; R; Q

B. Q; P; R

C. Q; R; P

D. R; Q; P

Correct Answer: A

Explanation: A is correct. Distance to Default (DtD) approximates the number of standard deviations to reach the default threshold; thus, the higher the DtD, the least likely to default.

$$DtD = \frac{\ln V_a - \ln F + \left(\mu - \frac{\sigma_a^2}{2}\right)(t)}{\sigma_a \sqrt{t}}$$

DtD can be simplified by reducing the forward time periods to 1 (t=1) and minimizing the drift factors ($\mu - \sigma^2/2$) that tend to be small (assumed to equal 0) over one period to yield:

$$DtD \cong \frac{\ln V_a - \ln F}{\sigma_a}$$

Using this formula results in:

DtD for Company P = ln(100/60)/0.10 = 5.11

DtD for Company Q = ln(150/100)/0.07 = 5.79

DtD for Company R = ln(250/160)/0.08 = 5.58

Q is least likely to default; R is in the middle; P is most likely to default.

Section: Credit Risk Measurement and Management

Reference: Giacomo De Laurentis, Renato Maino, and Luca Molteni, Developing, Validating and Using Internal Ratings (West Sussex, United Kingdom: John Wiley & Sons, 2010). Chapter 3 - Rating Assignment Methodologies

Learning Objective: Apply the Merton model to calculate default probability and the distance to default and describe the limitations of using the Merton model.

4. Bank HJK has written puts on Bank PQR stock to a hedge fund and sold CDS protection on Bank PQR to a manufacturer. Bank HJK and Bank PQR operate in several of the same businesses and geographies and their performances are highly correlated. Many in the market are concerned that rising interest rates could negatively impact the credit quality of Bank HJK's numerous borrowers, which in turn would increase the credit spread of Bank HJK. From the perspectives of the hedge fund and the manufacturer, which of the following is correct with respect to their counterparty risk exposure to Bank HJK?

	Hedge Fund	Manufacturer
A.	Right-way risk	Wrong-way risk
B.	Wrong-way risk	Right-way risk
C.	Right-way risk	Right-way risk
D.	Wrong-way risk	Wrong-way risk

Correct Answer: D

Explanation: D is correct.

The hedge fund has wrong-way risk. As interest rates rise, both Bank HJK's and Bank PQR's equity value would decline since the performances of the two banks are highly correlated. Therefore, the value of the long put option on PQR would increase, resulting in a higher exposure to bank HJK for the hedge fund. This is a wrong-way risk since the hedge fund's exposure to HJK would be increasing as the credit quality of HJK is declining.

The manufacturer also has wrong-way risk. Since the credit spread of Bank HJK is increasing and credit spreads of different banks in the same market tend to be positively correlated, the credit spread of Bank PQR should also increase. Therefore, the value of the manufacturer's long CDS position on Bank PQR is increasing at the same time the credit quality of Bank HJK is decreasing; thus, that is wrong-way risk.

Section: Credit Risk Measurement and Management

Reference: Jon Gregory, The xVA Challenge: Counterparty Credit Risk, Funding, Collateral, and Capital, 4th Edition (West Sussex, UK: John Wiley & Sons, 2020). Chapter 17. CVA

Learning Objective: Identify examples of wrong-way risk and examples of right-way risk.

Describe wrong-way risk and contrast it with right-way risk.

5. A risk consultant has been tasked with assessing a small bank's liquidity risk profile. While reviewing a presentation produced by the bank, the consultant comes across a list of early warning indicators used to signal potentially heightened liquidity risk. Which of the following trends should the consultant consider as the strongest warning signal for potential liquidity risk at the bank?

A. Decrease in stock price of the bank's peers but not in the stock price of the bank itself

B. Increase in credit lines received from other financial institutions

C. Widening spreads on the bank's issued debt and credit default swap

D. Significant asset growth funded by an increase in stable liabilities

Correct Answer: C

Explanation: C is correct. Wider spreads indicate a loss of market confidence in the bank and a higher cost of funding.
A is incorrect. A more bank-specific early-warning-indicator (EWI) would be a decrease in stock price of the bank relative to its peers.
B is incorrect. A decrease, not an increase, in credit lines is problematic for liquidity.
D is incorrect. Rapid asset growth funded by volatile liabilities would be more problematic.

Section: Liquidity and Treasury Risk

Reference: Shyam Venkat, Stephen Baird, Liquidity Risk Management (John Wiley & Sons, 2016). Chapter 6 - Early Warning Indicators

Learning Objective: Evaluate the characteristics of sound Early Warning Indicators (EWI) measures.

6. An investment bank has a one-way credit support annex (CSA) on a bilateral transaction with a hedge fund counterparty. Under the terms of the CSA, the mark-to-market value of the transaction forms the basis of the hedge fund's collateral requirements, which are provided below:

	Value (CNY)
Mark-to-market value of net exposure	25,000,000
Mark-to-market value of collateral posted	10,800,000
Threshold amount	14,000,000
Minimum transfer amount	2,500,000
Rounding amount	10,000

Assuming the net exposure increases to CNY 27,000,000 and the mark-to-market value of collateral posted has not changed, how much additional collateral will the hedge fund have to post?

A. CNY 0

B. CNY 1,990,000

C. CNY 2,000,000

D. CNY 2,500,000

Correct Answer: A

Explanation: A is correct.

Additional collateral (C) required for posting can be explained from the mark-to-market value of collateral posted (X), mark-to-market value of net exposure (E), the threshold (K), and the minimum transfer amount (MTA) as follows:

(i) Collateral call (C) can be made if: $E > (K + MTA + X)$

(ii) The collateral amount required: $C = E – K – X$, and the amount is positive if $(E – K – X) >$ MTA, otherwise it is zero.

In this example:

$(K + MTA + X) = 14,000,000+2,500,000+10,800,000 = 27,300,00 > E = 27,000,000$ which corresponds to no collateral call. Thus, A is correct.

B is incorrect. CNY 1,990,000 = new exposure – original exposure – rounding amount = 27,000,000 – 25,000,000 – 10,000, which is incorrect.

C is incorrect. CNY 2,000,000 is the difference between the new net exposure and the original net exposure (= 27,000,000 – 25,000,000 = CNY 2,000,000).

D is incorrect. CNY 2,500,000 is the minimum transfer amount.

Section: Credit Risk Measurement and Management

Reference: Jon Gregory, The xVA Challenge: Counterparty Credit Risk, Funding, Collateral, and Capital, 4th Edition (West Sussex, UK: John Wiley & Sons, 2020). Chapter 7 – Margin (Collateral) and Settlement

Learning Objective: Explain the features of a collateralization agreement.

7. The board of directors of an insurance company has identified a number of potential growth opportunities for the company to consider. To help assess these opportunities and determine an optimal risk structure to use across the organization, the risk committee has recommended that the company implement an ERM program. Which of the following would best represent an appropriate goal for the firm to state as part of the ERM program?

A. Determine a risk-return trade-off that reflects the company's target credit rating and ensure that business unit managers evaluate new projects with this firm-wide target in mind.

B. Attempt to eliminate the company's probability of financial distress to maximize company value.

C. Maximize the firm's leverage ratio within its risk tolerance to ensure the highest expected return on equity.

D. Establish a target minimum level of annual earnings and guarantee to shareholders that it will maintain this level.

Correct Answer: A

Explanation: A is correct. Determining the right amount of risk is one of the key goals when implementing ERM. One way to do this is to hold an amount of capital (reflecting an ideal risk-return tradeoff) which would lower the probability of financial distress to a level that matches the target credit rating. A VaR model or other methods could be used to determine this level. Once this target is set, it is then crucial to ensure that business unit managers keep this target firm-wide risk-return tradeoff in mind when evaluating new projects.

B is incorrect. What management can accomplish through an ERM program is not to minimize or eliminate but rather to limit the probability of distress to an acceptable level. Maximizing shareholder value requires an appropriate trade-off between risk and reward; even if a risk-minimizing strategy was potentially feasible, any strategy taken to minimize risk would generally not maximize shareholder value.

C is incorrect. Maximizing leverage and operating on the high end of risk tolerance is not optimal as a small adverse market move or change in its risk profile could put the firm over its risk limits.

D is incorrect; as long as there is risk involved, the firm cannot offer a guaranteed minimum level of earnings.

Section: Operational Risk and Resiliency

Reference: Brian Nocco and René Stulz, "Enterprise Risk Management: Theory and Practice," Journal of Applied Corporate Finance (2006): 18(4), 8–20

Learning Objective: Define enterprise risk management (ERM) and explain how implementing ERM practices and policies can create shareholder value, both at the macro and the micro level.

8. A large pension fund requires that the fund's managers do not breach the 2% tracking error limit at any point in time. A fund manager's performance for the most recent period is summarized below:

- Average return: 2.8%
- Volatility of returns: 1.9%
- Average return in excess of the benchmark (average active return): 0.6%
- Volatility of active returns: 1.7%

If the current risk-free interest rate is 1.2%, which of the following is correct?

A. The manager's average active return is below 2%, therefore the manager breached the limit.

B. The manager's average return in excess of the risk-free interest rate is below 2%, therefore the manager breached the limit.

C. The volatility of active returns achieved by the manager is below 2%, therefore the manager did not breach the limit.

D. The volatility of returns achieved by the manager is below 2%, therefore the manager did not breach the limit.

Correct Answer: C

Explanation: C is correct. Tracking error is the standard deviation of active returns (Active return is defined as the excess return over a benchmark). In this instance, the standard deviation of active returns is 1.7% and therefore the manager did not breach the limit.

A, B, and D are incorrect. They use incorrect criteria for determining the tracking error.

Section: Risk Management and Investment Management

Reference: Andrew Ang, Asset Management: A Systematic Approach to Factor Investing (New York, NY: Oxford University Press, 2014). Chapter 10. Alpha (and the Low-Risk Anomaly)

Learning Objective: Define and calculate alpha, tracking error, the information ratio, and the Sharpe ratio.

9. A risk analyst is estimating the return of an investment portfolio using the Fama-French three-factor model. The analyst regresses thirty years of weekly portfolio returns against the three factors of the model. The analyst obtains the following regression results:

Factor	Coefficient
Alpha	0.10
Market loading	0.52
SMB loading	0.18
HML loading	-0.70

Assuming all estimated coefficients are statistically significant, which of the following is correct?

A. The portfolio return is positively correlated with the size factor, and this should decrease its performance since small-cap stocks generally underperform large-cap stocks over time.

B. The portfolio return is positively correlated with the value factor, and this should increase its performance since stocks with low book-to-market values generally underperform stocks with high book-to-market values over time.

C. The portfolio return is negatively correlated with the size factor, and this should increase its performance since stocks with high market capitalizations generally outperform stocks with low market capitalizations over time.

D. The portfolio return is negatively correlated with the value factor, and this should decrease its performance since value stocks generally outperform growth stocks over time.

Correct Answer: D

Explanation: D is correct.

The two Fama-French factors, SMB and HML, are factors that measure size and value-growth exposures, respectively.
The SMB factor measures the relative performance of small-capitalization stocks compared to large-capitalization stocks. Small stocks tend to outperform large stocks over time (although evidence of this effect has become weaker in recent years), and a positive coefficient indicates the portfolio's exposure to small stocks. SMB is defined as the performance of small capitalization stocks minus the performance of big capitalization stocks.
The HML factor measures the relative performance of value stocks compared to growth stocks. Value stocks tend to outperform growth stocks, and a negative coefficient indicates the portfolio's exposure to growth stocks. HML is defined as the performance of value stocks (those with high book-to-market values) minus the performance of growth stocks (those with low book-to-market values).
D is correct because the negative HML factor indicates that the portfolio is more exposed to growth stocks, which would tend to decrease its performance over time.

Section: Risk Management and Investment Management

Reference: Andrew Ang, Asset Management: A Systematic Approach to Factor Investing (New York, NY: Oxford University Press, 2014). Chapter 7. Factors

Learning Objective: Explain how dynamic risk factors can be used in a multifactor model of asset returns, using the Fama-French model as an example.

10. An operational risk manager is asked to report a bank's operational risk capital under the Standardized Measurement Approach (SMA) proposed by the Basel Committee in March 2016. The treasury department produces the following data for the bank, calculated according to the SMA guidelines:

- Business Indicator (BI): EUR 1,200 million
- Internal Loss Multiplier: 1

In addition, the manager uses the Business Indicator buckets in the Business Component presented in the table below:

Bucket	BI Range	BI Component
1	EUR 0 to EUR 1 billion	0.12*BI
2	EUR 1 billion to EUR 30 billion	EUR 120 million + 0.15(BI – EUR 1 billion)
3	Higher than EUR 30 billion	EUR 4.47 billion + 0.18(BI – EUR 30 billion)

What is the correct operational risk capital that the bank should report under the SMA?

A. EUR 120 million

B. EUR 150 million

C. EUR 158 million

D. EUR 180 million

Correct Answer: B

Explanation: B is correct. Under the revised Standardized Measurement Approach, operational risk capital is equal to the Business Indicator Component multiplied by the Internal Loss Multiplier.

The Business Indicator Component is determined by the Business Indicator (BI), which is made up of almost the same P&L items that are found in the composition of Gross Income (GI). The main difference relates to how the items are combined. The BI uses positive values of its components, thereby avoiding counterintuitive negative contributions from some of the bank's businesses to the capital charge (e.g., negative P&L on the trading book), which is possible under the GI. In addition, the BI includes income statement items related to activities that produce operational risk that are omitted (e.g., P&L on the banking book) or netted (e.g., fee expenses, other operating expenses) in the GI.

In this case, the BI is already given as EUR 1,200 million.

Therefore, with a BI of EUR 1,200 million falling into the BI range of Bucket 2, and given that the Internal Loss Multiplier is equal to 1, the calculation of the operational risk capital for the bank in Bucket 2 is calculated as follows:

SMA operational risk capital (Bucket 2) = BIC*1 = EUR 120 million + 0.15(BI – EUR 1 billion) = EUR 120 million + 0.15(EUR 1,200 million – EUR 1,000 million) = EUR 150 million.

Section: Operational Risk and Resiliency

Reference: "Basel III: Finalising post-crisis reforms," (Basel Committee on Banking Supervision Publication, December 2017): 128–136. Chapter 9 - The Art of Term Structure Models: Drift

Learning Objective: Explain the elements of the new standardized approach to measure operational risk capital, including the business indicator, internal loss multiplier, and loss component, and calculate the operational risk capital requirement for a bank using this approach.

11. A credit manager who is well versed in lessons learned from the 2007–2009 subprime mortgage crisis in the US is overseeing the structured credit book of a bank in order to identify potential problems of information flow (frictions) between the parties involved in the securitization process. Which of the following is a correct combination of a potential friction in the securitization process and an appropriate mechanism to mitigate that friction?

A. Friction between the asset manager and the investor: Adverse selection problem. This problem can be mitigated by the asset manager charging due diligence fees to the investor.

B. Friction between the arranger and the originator: Model error problem. This problem can be mitigated by the arranger providing a credit enhancement to the securitized products with its own funding.

C. Friction between the investor and credit rating agencies: Principal-agent conflict. This problem can be mitigated by requiring credit rating agencies to be paid by originators and not by investors for their rating services.

D. Friction between the servicer and the mortgagor: Moral hazard problem. This problem can be mitigated by requiring the mortgagor to escrow funds for insurance and tax payments.

Correct Answer: D

Explanation: D is correct. The friction between the servicer and the mortgagor is a moral hazard problem. The servicer and the mortgagor do not share the full consequence of bad outcomes (e.g., loan foreclosure, delinquencies). The mortgagor typically has limited liability and has little incentive to expend effort or resources to maintain a property close to foreclosure. On the other hand, the servicer strives to work in investors' best interest by keeping up with payment of property taxes and insurance, and generally maintaining the property. A way to mitigate this friction is to require the mortgagor to regularly escrow funds for insurance and tax payments in order to forestall the risk of foreclosure.

A is incorrect. Friction between the asset manager and the investor is a principal-agent problem. The investor is less sophisticated than the asset manager, does not fully understand the investment strategy of the asset manager, has uncertainty about the manager's ability, and does not observe any effort that the manager makes to conduct due diligence. Some of the ways to mitigate this friction is through the use of investment mandate, and the evaluation of manager performance relative to its peers or a peer benchmark.

B is incorrect. Friction between the arranger and originator is a predatory borrowing and lending problem. It is one of the key frictions in the process of securitization involving an information problem between the originator and arranger. In particular, the originator has an information advantage over the arranger with regard to the quality of the borrower. Without adequate safeguards in place, an originator can have the incentive to collaborate with a borrower in order to make significant misrepresentations on the loan application. Depending on the situation, this could be either construed as predatory lending (where the lender convinces the borrower to borrow too large of a sum given the borrower's financial situation) or predatory borrowing (the borrower convinces the lender to lend too large a sum). To mitigate the problem, the arranger should have safeguards in place, including carrying out a thorough due diligence on the originator and requiring the originator to have adequate capital to buy back problem loans.

C is incorrect. Friction between the investor and credit rating agencies is a model error problem. Investors are not able to assess the efficacy of rating agency models and, so, are susceptible to both honest and dishonest errors. Worse still, rating agencies are paid by

the arranger and not by the investors for their opinion, which creates a potential conflict of interest. This friction can be mitigated by requiring public disclosure of the criteria for ratings and downgrades, and for holding rating agencies accountable for their reputation.

Section: Credit Risk Measurement and Management

Reference: Adam Ashcroft and Til Schuermann, "Understanding the Securitization of Subprime Mortgage Credit," Federal Reserve Bank of New York Staff Reports, No. 318 (March 2008)

Learning Objective: Identify and describe key frictions in subprime mortgage securitization, and assess the relative contribution of each factor to the subprime mortgage problems.

12. An analyst at an investment bank uses interest-rate trees to forecast short-term interest rates. The analyst applies the following model for estimating monthly changes in a short-term interest rate tree:

$$dr = \lambda(t)*dt + \sigma(t)*dw$$

In this process, λ(t) represents the drift in month t, σ(t) represents the volatility in month t, dt is the time interval measured in years, and dw is a normally distributed random variable with a mean of zero and a standard deviation of the square root of dt. The analyst uses the following information to make the calculations:

- Current level of short-term interest rate: 3.1%
- Drift in month 1 (λ(1)): 0.0024
- Drift in month 2 (λ(2)): 0.0036
- Annualized volatility of the interest rate in month 1 (σ(1)): 0.0060
- Annualized volatility of the interest rate in month 2 (σ(2)): 0.0080
- Probability of an upward or downward movement in interest rates: 0.5

What is the volatility component of the change in interest rate from the upper node of month 1 to the upper node of month 2?

A. 23 bps
B. 26 bps
C. 40 bps
D. 45 bps

Correct Answer: A

Explanation: A is correct. The impact of volatility to the change in the interest rate between date 1 and date 2 will be the same at any node on date 2. Since the standard deviation of dw is √dt, the standard deviation of the rate change is σ(t)*dw = σ(t)*√dt. So, the volatility component of the change in interest rate is 0.0080√1/12 = 0.0023, 23 bps, up or down.

B is incorrect. This answer choice includes drift and volatility to the upper node at date 2. 0.0036/12 + 0.0080√1/12 = 0.0003 + 0.0023 = 0.0026

C is incorrect. This includes the volatility impact at date 1 and date 2. 0.0060√1/12 + 0.0080√1/12 = 0.0040

D is incorrect. This includes the drift and volatility impact from the initial rate to the upper node at date 2.

Section: Market Risk Measurement and Management

Reference: Bruce Tuckman and Angel Serrat, Fixed Income Securities: Tools for Today's Markets, 3rd Edition (Hoboken, NJ: John Wiley and Sons, 2011). Chapter 10. The Art of Term Structure Models: Volatility and Distribution

Learning Objective: Calculate the short-term rate change and determine the behavior of the standard deviation of the rate change using a model with time dependent volatility.

13. A regulatory analyst at a large multinational bank is examining regulatory requirements the bank must comply with under the Basel Committee's FRTB guidelines. The analyst explores how the FRTB guidelines evolved from the Basel I and Basel II.5 frameworks as well as the instructions for applying the guidelines. Which of the following is correct regarding the FRTB?

A. While Basel I and Basel II.5 allowed market risk to be calculated at the trading desk level, FRTB requires that market risk be calculated on a firm-wide basis.

B. While Basel I and Basel II.5 emphasized the use of a standardized approach to calculating market risk, FRTB encourages each bank to develop and rely on an internal models approach.

C. FRTB standardizes the liquidity horizon used for all risk factors in the market risk capital calculation as 10 days, rather than the different horizons used in Basel I and Basel II.5.

D. FRTB requires that the stressed ES measure be used in determining market risk capital, rather than the VaR and stressed VaR measures that were used in Basel I and Basel II.5, respectively.

Correct Answer: D

Explanation: D is correct. The Basel committee has moved from the VaR and stressed VaR measures used in Basel I and Basel II.5 to the stressed ES measure used in FRTB.

A is incorrect. The reasoning is reversed. FRTB allows market risk to be calculated at the trading desk level.

B is incorrect. The FRTB is a culmination of Basel committee efforts to place less reliance on internal models approach. Under FRTB, all banks must calculate market risk capital using a standardized approach, even if they have been approved to use an internal models approach.

C is incorrect. The FRTB introduces 5 different liquidity horizons that are better matched to the liquidity horizons of different risk factors than the earlier 10-day horizons used in Basel I and Basel II.5.

Section: Market Risk Measurement and Management

Reference: John Hull, Excerpt of Chapter 18 of Risk Management and Financial Institutions, 5th edition

Learning Objective: Describe the changes to the Basel framework for calculating market risk capital under the Fundamental Review of the Trading Book (FRTB) and the motivations for these changes

14. A CRO of a hedge fund is asking the risk team to develop a term-structure model that is appropriate for fitting interest rates for use in the fund's options pricing practice. The risk team is evaluating several interest rate models that incorporate either time-dependent drift or time-dependent volatility functions. Which of the following is a correct description of the specified model?

A. In the Ho-Lee model, the drift of the interest rate process is assumed to be constant.

B. In the Ho-Lee model, when the short-term rate is above its long-run equilibrium value, the drift is assumed to be negative.

C. In the Cox-Ingersoll-Ross model, the basis-point volatility of the short-term rate is assumed to be proportional to the square root of the rate, and short-term rates cannot be negative.

D. In the Cox-Ingersoll-Ross model, the volatility of the short-term rate is assumed to decline exponentially to a constant long-run level.

Correct Answer: C

Explanation: C is correct. In the CIR model, the basis-point volatility of the short rate is not independent of the short rate as other simpler models assume. The annualized basis-point volatility equals σ*sqrt(r). Short-term rate in the CIR model cannot be negative because of the combined property that (i) basis-point volatility equals zero when short-term rate is zero, and (ii) the drift is positive when the short-term rate is zero.

A is incorrect. In the Ho-Lee model, the drift of the interest rate process is presumed to be time-varying.

B is incorrect. No long-run equilibrium value is defined in the Ho-Lee model.

D is incorrect. The volatility of the short-term rate is assumed to be proportional to the square root of the short-rate in the CIR model.

Section: Market Risk Measurement and Management

Reference: Bruce Tuckman and Angel Serrat, Fixed Income Securities, 3rd Edition (Hoboken, NJ: John Wiley & Sons, 2011). Chapter 9: The Art of Term Structure Models: Drift

Bruce Tuckman and Angel Serrat, Fixed Income Securities, 3rd Edition (Hoboken, NJ: John Wiley & Sons, 2011). Chapter 10: The Art of Term Structure Models: Volatility and Distribution

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

Construct a short-term rate tree under the Ho-Lee Model with time-dependent drift.

Describe the short-term rate process under the Cox-Ingersoll-Ross (CIR) and lognormal models.

15. Due to lack of available investment opportunities in public markets, a pension fund decided to hire an investment consultant to assess the potential for investing in illiquid markets in the US. Which of the following characteristics of illiquid markets in the US should the consultant present to the pension managers?

A. Municipal bonds are usually more liquid than pinksheet over-the-counter equities.

B. The traditional public, liquid markets of stocks and bonds are larger than the total wealth held in illiquid assets.

C. The share of illiquid assets in institutional portfolios has generally gone up in the past 2 decades.

D. During the 2008-2009 Financial Crisis, liquidity dried up in repo markets but not in commercial paper markets.

Correct Answer: C

Explanation: C is correct. Both pensions and endowments have increased their holdings of alternative assets from about 5% to 20-25%.

A is incorrect. Municipal bonds have less than 10% turnover, much lower than approximately 35% for OTC equities.

B is incorrect. US real estate markets are large compared to size of US stocks/bonds.

D is incorrect. Liquidity dried up in both markets.

Section: Liquidity and Treasury Risk

Reference: Andrew Ang, Asset Management: A systematic Approach to Factor Investing (Oxford University Press, 2014). Chapter 13 - Illiquid Assets

Learning Objective: Evaluate the characteristics of illiquid markets.

16. A portfolio manager at a hedge fund is applying the Merton model to estimate the volatility of a non-dividend-paying firm whose equity shares are held in the fund's portfolio. The manager conducts preliminary analysis on the firm and obtains the following results:

- Value of equity: USD 45 million
- Value of the firm's only debt maturing in 5 years: USD 60 million
- d_1: 3.217790
- d_2: 3.038905

Assuming a constant volatility of firm value, what is the estimate of that volatility?

A. 6%

B. 8%

C. 16%

D. 18%

Correct Answer: B

Explanation: B is correct. The Merton model can be used for estimating the value of equity (E) as presented in Equation (1) below:

$$E = V*N(d_1) - D*N(d_1 - \sigma\sqrt{T-t}) \quad \text{..... (1)}$$

Where:

V = firm value

D = debt value

σ = volatility of firm value

T – t = time remaining to maturity of debt

And:

$$d_1 = \frac{ln(V)-ln(D)}{\sigma\sqrt{T-t}} + 0.5 * \sigma\sqrt{T-t} \quad \text{..... (2)}$$

$$d_2 = (d_1 - \sigma\sqrt{T-t}) \quad \text{..... (3)}$$

The reading (pages 116-118, CR-5) discusses how firm volatility can be derived using simultaneous Equations (1) and (2) with two unknowns, V and σ. Given the parameter values above (in our simplified case), we only need Equation (3) to estimate firm volatility. Thus, using Equation (3):

3.038905 = 3.217790 – σ*sqrt(5)

σ = (3.217790 – 3.038905)/2.23608 = 0.079999 = 8.0%

A is incorrect. 6% is the incorrect result obtained by (d_1/d_2 – 1).

C is incorrect. 16% is the incorrect result obtained if 0.5 is applied to the last term in Equation (3).

D is incorrect. 18% is the firm volatility assuming debt matures in 1 year.

Section: Credit Risk Measurement and Management

Reference: Rene Stulz, Risk Management & Derivatives (Florence, KY: Thomson South-Western, 2002). Chapter 18, Credit Risks and Credit Derivatives.

Learning Objective: Using the Merton model, calculate the value of a firm's debt and equity and the volatility of firm value.

17. A regional bank wants to improve its operational resilience to help keep pace with emerging best practices in this area. A consultant hired by the bank recommends that it establish a set of impact tolerances to improve its resilience. Which of the following correctly describes a potential benefit to the bank of establishing an impact tolerance?

A. It will enhance the bank's ability to identify and limit concentration risk.

B. It will accurately estimate the severity of a potential disruption to an operational process and the amount of downtime that would result.

C. It will help the bank optimize its allocation of resources to its most important business services.

D. It will prevent failures of critical operational processes and the systems that support these processes.

Correct Answer: C

Explanation: C is correct. An impact tolerance quantifies the amount of disruption that could be tolerated by the bank in the event of a severe but plausible incident. By setting an impact tolerance, the firm is identifying its most crucial operational processes and can then allocate its resources towards these processes with the goal of remaining within the impact tolerance range. Firms should consider the chain of activities which make up the important business service, from taking on an obligation to delivery of the service and determine those parts of the chain that are critical to delivery of the important business service. The PRA expects that the critical parts of the chain should be operationally resilient, and that firms should focus their work on the resources necessary to deliver them. (p. 395 of new draft)

A is incorrect. Concentration risk is more related to situations in which the bank has a limited number of potential technology vendors to whom it could outsource services or a concentration of counterparty exposures to one asset class, counterparty, or market sector. An impact tolerance does not generally help the bank identify concentration risk but can help the bank assess its operational tolerance given an unavoidable concentration.

B is incorrect. Scenario analysis is used to produce estimates of potential disruption. The impact tolerance is set based on the results of the scenarios as well as the bank's own experiences in the past.

D is incorrect. An impact tolerance does not prevent failure of critical processes; rather it determines a tolerance range for a potential failure or disruption.

Section: Operational Risk and Resiliency

Reference: "Operational resilience: Impact tolerance for important business services," (Bank of England Policy Statement 6/21, March 2021). (Include Appendix 2 and 3)

Learning Objective: Describe an impact tolerance; explain best practices and potential benefits for establishing the impact tolerance for a business service.

18. A manager is evaluating the risks of a portfolio of stocks. Currently, the portfolio is valued at CNY 124 million and contains CNY 14 million in stock Y. The annualized standard deviations of returns of the overall portfolio and of stock Y are 16% and 12%, respectively. The correlation of returns between the portfolio and the stock Y is 0.52. Assuming the risk analyst uses a 1-year 95% VaR and the returns are normally distributed, what is the component VaR of stock Y?

A. CNY 0.103 million

B. CNY 1.437 million

C. CNY 2.032 million

D. CNY 3.685 million

Correct Answer: B

Explanation: B is correct. The component VaR for stock T ($CVaR_T$) can be presented as:

$CVaR_T = VaR_T * \rho_{T,p}$,

where VaR_T = VaR of stock T and $\rho_{T,p}$= correlation coefficient between stock T and the portfolio.

Let w_T represent the value of stock T,

σ_T represent the standard deviation of stock T returns, and

$\alpha(95\%)$ represent the 95% confidence factor for the VaR estimate, which is 1.645.

Hence,

$VaR_T = w_T * \sigma_T * \alpha(95\%)$ = CAD 15 million x 0.13 x 1.645 = CAD 3.208 million.

Therefore,

$CVaR_T = \rho_{T,p} * VaR_T$ = 0.45 x 3.208 = CAD 1.444 million.

A is incorrect. 0.096 is the marginal VaR of stock T, calculated as follows: (0.45*0.13/0.16)*1.645*0.16. Marginal VaR measure is unitless.

C is incorrect. CAD 2.041 million is the component VaR of stock T if the manager incorrectly uses the 99% VaR, i.e., 15*0.13*2.326*0.45.

D is incorrect. CAD 3.948 million is the incremental VaR of stock T (assuming that the volatility of the portfolio without stock T remains 16% and the correlation of returns between stock T and the portfolio without stock T is 0.45). It is simply the weight of stock T in the portfolio multiplied by the portfolio VaR, i.e. (15/248)*(248*0.16*1.645).

Section: Risk Management and Investment Management

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

Learning Objective: Define, calculate, and distinguish between the following portfolio VaR measures: diversified and undiversified portfolio VaR, individual VaR, incremental VaR, marginal VaR, and component VaR.

19. A fixed-income portfolio analyst is calculating the i-spread on a 10-year, 3.5% fixed-rate USD-denominated bullet bond issued by Bank TBT. The bond is currently rated A-, has no embedded options, makes semi-annual payments, and has 4.5 years remaining to maturity. The analyst obtains the following information:

- Yield to maturity of the bond: 4.67%
- Yield on the nearest-maturity on-the-run Treasury note: 1.15%
- Yield on a 4-year Treasury note: 1.65%
- Yield on a 5-year Treasury note: 2.08%
- The linearly interpolated 4.5-year swap rate: 1.94%
- The z-spread: 316 bps

What is the i-spread on the bond?

A. 151 bps
B. 273 bps
C. 352 bps
D. 431 bps

Correct Answer: B

Explanation: B is correct. The i-spread is the difference between the interpolated yield and the yield on the credit-risky bond = 4.67 – 1.94 = 2.73% = 273 bps.

A is incorrect. 151 bps is the difference between the yield to maturity of the bond and the z-spread.

C is incorrect. 352 bps is the bonds yield spread.

D is incorrect. 431 bps is the result of adding the z-spread to the yield on the nearest-maturity on-the-run Treasury note.

Section: Credit Risk Measurement and Management

Reference: Allan Malz, Financial Risk Management: Models, History, and Institutions (Hoboken, NJ: John Wiley & Sons, 2011). Chapter 7. Spread Risk and Default Intensity Models

Learning Objective: Compute one credit spread given others when possible.

20. A credit manager at a US-based commercial bank asks a team of risk analysts to examine the risks attributed to a large retail credit portfolio of the bank. The manager instructs the analyst to suggest measures to mitigate the "dark side" of retail credit risk affecting the portfolio. Which of the following would most likely be an effective measure?

A. Focus the extension of credit on low default portfolios such as mortgages or large corporations.

B. Concentrate on expected loss estimation since systematic risk factors such as a real estate crisis or a sharp economic downturn can be diversified away.

C. Monitor the effectiveness of credit risk assessment tools for retail customers and adjust the tools as needed.

D. Use stress tests to analyze the exposure to idiosyncratic risk factors of every single retail credit customer.

Correct Answer: C

Explanation: C is correct. The dark side of retail credit portfolios are given by a sudden rise of credit losses due to unexpected but systematic factors that influence the creditworthiness and the behavior of many credit customers in a bank's retail portfolio. An example of a systematic risk factor is the weak (or undetected) performance or the bias of credit risk assessment tools for retail customers.

A is incorrect. Focusing on big corporations does not address the dark side risk affecting the retail credit.

B is incorrect. The systematic risk factors mentioned are non-diversifiable risks.

D is incorrect. Stress tests only help to evaluate/determine risk but do not mitigate risks.

Section: Credit Risk Measurement and Management

Reference: Michel Crouhy, Dan Galai and Robert Mark, The Essentials of Risk Management, 2nd Edition (New York, NY: McGraw-Hill, 2014). Chapter 9. Credit Scoring and Retail Credit Risk Management

Learning Objective: Discuss the "dark side" of retail credit risk and the measures that attempt to address the problem.

21. The CRO at a bank wants to strengthen the bank's capability to defend itself against emerging cyber-threats. To help achieve this goal, the CRO is assessing the current range of practices regarding the sharing of cybersecurity information between different types of institutions, as well as the potential benefits from sharing information. Which of the following statements would be most appropriate for the CRO to make?

A. The sharing of cybersecurity information among banks is less frequently observed and generally considered to be less effective than other cyber-security information-sharing practices.

B. The scope and depth of information-sharing practices among banks may significantly vary between financial markets, depending on the level of trust among participating banks.

C. Information-sharing among different national regulators has evolved significantly over the past several years and is now a widespread practice at a large majority of jurisdictions.

D. Existing peer-sharing mechanisms among banks focus on the exchange of information related to cyber-security incidents, but such information is generally not shared from banks to regulators.

Correct Answer: B

Explanation: B is correct. Sharing of information and collaboration among banks depends on the financial industry's culture and level of trust among participants. Experience shows that a two-level information-sharing structure through which information would be first shared on the interpersonal level with a closer group and then be exchanged at the company level with a broader group of banks helps build trust into the system.

A is incorrect. Sharing of information among banks is one of the most widely observed practices across jurisdictions and a relatively wider range of information, such as knowledge about cyber threats / cyber intelligence is typically shared among banks.

C is incorrect. Sharing amongst regulators is one of the least observed practices and a majority of jurisdictions do not currently allow it.

D is incorrect. Banks typically do not share information about cyber-incidents with each other, but they do share this information with regulators at times when required by regulatory reporting practices.

Section: Operational Risk and Resiliency

Reference: "Cyber-Resilience: Range of Practices", Basel Committee on Banking Supervision, December 2018

Learning Objective: Explain and assess current practices for the sharing of cybersecurity information between different types of institutions.

22. A risk manager is training junior risk analysts at an international bank. The manager is instructing them about the difference between repurchase agreements (repos) and reverse repurchase agreements (reverse repos), as well as the relevant market participants. Which of the following is a correct statement for the manager to present to the class?

A. A trader who would like to short a bond could enter into a repo to borrow the bond.

B. Haircuts on collateral are typically charged to those who lend collateral in repo transactions, but margin calls are usually not made.

C. When financing a purchase of securities, financial institutions often sell the repo to avoid putting up full purchase price for the securities.

D. Money market mutual funds tend to enter into a repo to invest short-term liquid instruments.

Correct Answer: C

Explanation: C is correct. Selling the repo is the same as entering into a repo agreement, where the security is sold and bought back later.

A is incorrect. A reverse repo should be made to borrow the bond.

B is incorrect. Margin calls are also common.

D is incorrect. Money market mutual funds enter into reverse repo agreements to invest in short-term instruments.

Section: Liquidity and Treasury Risk

Reference: Bruce Tuckman and Angel Serrat, Fixed Income Securities: Tools for Today's Markets, 3rd edition (John Wiley & Sons, 2011). Chapter 12 - Repurchase Agreements and Financing

Learning Objective: Discuss common motivations for entering into repos, including their use in cash management and liquidity management.

23. The risk audit committee of an equity mutual fund is reviewing a portfolio construction technique proposed by a new portfolio manager who has recently been allocated capital to manage. The fund typically grants its portfolio managers flexibility in selecting and implementing appropriate portfolio construction procedures but requires that any methodology adopted fulfills key risk control objectives set by the firm. Which of the following portfolio construction techniques and its capability for risk control in portfolio construction is correct?

A. Quadratic programming allows for risk control through parameter estimation but generally requires many more inputs estimated from market data than other portfolio construction techniques do.

B. The screening technique provides superior risk control by concentrating stocks in selected sectors based on expected alpha.

C. When using the stratification technique, risk control is implemented by overweighting the categories with lower risks and underweighting the categories with higher risks.

D. When using the linear programming technique, risk is controlled by selecting the portfolio with the lowest level of active risk.

Correct Answer: A

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

B is incorrect. The screening technique strives for risk control by including a sufficient number of stocks that meet the screening parameters and by weighting them to avoid concentrations in any particular stock.

However, screening does not necessarily select stocks evenly across sectors and can ignore entire sectors or classes of stocks if they do not pass the screen. Therefore, risk control in a screening process is fragmentary at best.

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

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

Section: Risk Management and Investment Management

Reference: Richard Grinold and Ronald Kahn, Active Portfolio Management: A Quantitative Approach for Producing Superior Returns and Controlling Risk, 2nd Edition (New York: McGraw-Hill, 2000). Chapter 14 - Portfolio Construction.

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

24. A hedge fund manager is concerned about a potential increase in investor redemptions and wants to assess the effects of such an event on the fund's liquidity. The manager asks a junior analyst to estimate the average number of days required to liquidate certain securities in the fund. The analyst uses the information presented below to make this estimation for four securities:

Security	Market value of security in the fund (CNY million)	Shares of security in the fund	Average daily trading volume of security	Maximum daily volume allowed for liquidation (expressed as a percentage of average daily trading volume)
A	93.00	500,000	522,000	22%
B	173.04	420,000	1,328,000	12%
C	58.88	256,000	710,000	18%
D	28.80	640,000	848,000	20%

Which of the four securities listed above is expected to take the longest to liquidate?

A. Security A
B. Security B
C. Security C
D. Security D

Correct Answer A

Explanation A is correct.

We calculate the liquidity duration (LD_i) of each security as shown below:

Security (i)	Q_i	MDV_i	V_i	$LD_i = Q_i/(MDV_i*V_i)$
A	500,000	22%	522,000	4.3539
B	420,000	12%	1,328,000	2.6355
C	256,000	18%	710,000	2.0031
D	640,000	20%	848,000	3.7736

where;

Q_i: Number of shares held in security i

MDV: Maximum daily volume allowed for liquidation of security i

(expressed as a percentage of average daily volume)

V_i: Average daily volume of security i

Security A has the highest liquidity duration and will take the longest to liquidate.

Section: Risk Management and Investment Management

Reference: Robert Litterman and the Quantitative Resources Group, Modern Investment Management: An Equilibrium Approach (Hoboken, NJ: John Wiley & Sons, 2003). Chapter 17. Risk Monitoring and Performance Measurement

Learning Objective: Describe the Liquidity Duration Statistic and how it can be used to measure liquidity.

25. A treasurer at a small regional bank is assessing the bank's liquidity position. The treasurer estimates that the following cash inflows and outflows will occur in the next week:

Cash Flows	Amount (USD million)
Deposit withdrawals	30
Deposit inflows	70
Scheduled loan repayments	80
Acceptable loan requests	50
Borrowings from money market	60
Operating expenses	40
Stockholder dividend payments	20
Repayment of bank borrowings	30

Which of the following is the correct amount (in millions of USD), at the week's end, for the bank's net liquidity position?

A. -80
B. -20
C. 40
D. 100

Correct Answer: C

Explanation: C is correct. -30+70+80-50+60-40-20-30=40

A is incorrect. Flips the sign for borrowings from money market.

B is incorrect. Flips the sign for scheduled loan repayments and acceptable loan requests.

D is incorrect. Flips the sign for repayment of bank borrowings.

Section: Liquidity and Treasury Risk

Reference: Peter Rose, Sylvia Hudgins, Bank Management & Financial Services, Ninth Edition (John Wiley & Sons, 2011). Chapter 11 - Liquidity and Reserve Management: Strategies and Policies

Learning Objective: Calculate a bank's net liquidity position and explain factors that affect the supply and demand of liquidity at a bank.

26. A packaging materials manufacturer is considering a project that has an estimated risk-adjusted return on capital (RAROC) of 15%. Suppose that the risk-free interest rate is 3% per year, the expected market rate of return is 11% per year, and the company's equity beta is 1.8. The manufacturer uses the adjusted RAROC metric as the criterion to decide whether or not to accept the project. Which of the following correctly describes the decision the company should make and the rationale for making that decision?

A. Reject the project because the adjusted RAROC is higher than the market expected excess return.

B. Accept the project because the adjusted RAROC is higher than the market expected excess return.

C. Reject the project because the adjusted RAROC is lower than the risk-free interest rate.

D. Accept the project because the adjusted RAROC is lower than the risk-free interest rate.

Correct Answer: C

Explanation: C is correct. Consider the basic adjusted RAROC (ARAROC) formula for a project: ARAROC = RAROC - $\beta_E*(R_m - R_f)$

Where:

β_E = Beta of the equity of the firm R_m = Expected market rate of return R_f = Risk-free rate of interest

$\beta_E*(R_m - R_f)$ = Risk premium of the project.

ARAROC is simply "RAROC adjusted for the systematic riskiness of the returns". ARAROC can be used in evaluating the project in the following way: If the project's "RAROC less the project's risk premium" is greater than the risk-free rate, then the firm's shareholders are compensated for the non-diversifiable systematic risk they bear when investing in the activity, assuming the investors hold a well-diversified portfolio (i.e., the project adds value). That is, if the project's ARAROC exceeds the risk-free rate, it should be accepted by the firm. Otherwise, if it is less than the risk-free rate, the project should be rejected.

Given RAROC = 15%, β_E = 1.8, R_m = 11% and R_f = 3%, one can compute ARAROC = 0.15-1.8*(0.11- 0.03) = 0.006 = 0.6% and is less than R_f = 3%. Thus, the project is rejected.

Section: Operational Risk and Resiliency

Reference: Michel Crouhy, Dan Galai and Robert Mark, The Essentials of Risk Management, 2nd Edition (New York: McGraw-Hill, 2014). Chapter 17 - Risk Capital Attribution and Risk-Adjusted Performance Measurement.

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

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

A. Ensuring that sufficient collateral is posted by counterparties

B. Diversifying among counterparties

C. Cross-product netting on a single counterparty basis

D. Purchasing credit derivatives, such as credit default swaps

Correct Answer: A

Explanation: A is correct. Counterparty exposure, in theory, can be almost completely neutralized as long as a sufficient amount of high-quality collateral, such as cash or short-term investment grade government bonds, is held against it. If the counterparty were to default, the holder of an open derivative contract with exposure to that counterparty would be allowed to receive the collateral.

B is incorrect. The company already has contracts with a handful of other firms that dominate the market for the rare derivatives asked in the question and thus diversification cannot be a solution.

C and D are incorrect. Cross-product netting would only reduce the exposure to one of the counter-parties and purchasing credit derivatives would replace the counterparty risk from the individual counterparties with counterparty risk from the institution who wrote the CDS.

Section: Credit Risk Measurement and Management

Reference: Jon Gregory, The xVA Challenge: Counterparty Credit Risk, Funding, Collateral, and Capital, 4th Edition (West Sussex, UK: John Wiley & Sons, 2020). Chapter 3 – Counterparty Risk and Beyond

Jon Gregory, The xVA Challenge: Counterparty Credit Risk, Funding, Collateral, and Capital, 4th Edition (West Sussex, UK: John Wiley & Sons, 2020). Chapter 7 – Margin (Collateral) and Settlement

Learning Objectives: Identify and describe the different ways institutions can quantify, manage and mitigate counterparty risk.

Describe the rationale for collateral management.

Describe the terms of a collateral agreement and features of a credit support annex (CSA) within the ISDA Master Agreement including threshold, initial margin, minimum transfer amount and rounding, haircuts, credit quality, and credit support amount.

28. HIP Bank (HIP) often enters into interest rate swaps with ADB Banking Corporation (ADB) on terms that reflect appropriate counterparty risk. Earlier in the year, HIP and ADB entered into a 3-year swap in which ADB agreed to pay HIP a fixed rate of 5% in return for 6-month LIBOR plus a spread. Since the swap was entered into, both banks were downgraded. As a result of the ratings changes, the credit spread for HIP has increased from 36 bps to 144 bps, while the credit spread for ADB has increased from 114 bps to 156 bps. Assuming no change in the LIBOR curve, if an identical 3-year swap was entered into today, which of the following is the most likely to be correct?

A. Since HIP's spread increased more than ADB's spread, HIP's DVA will increase and ADB's DVA will decrease.

B. Since HIP's spread increased more than ADB's spread, HIP's CVA will increase and ADB's CVA will decrease.

C. Since both banks' spreads increased, the CVA on both sides of the contract will be higher.

D. Since both banks' spreads increased, the DVA on both sides of the contract will be lower.

Correct Answer: C

Explanation: C is correct. The lower credit qualities and increased credit spreads should result in higher DVA and CVA for both ADB and HIP. Therefore, only C is correct, and A, B and D are all incorrect.

Section: Credit Risk Measurement and Management

Reference: Jon Gregory, The xVA Challenge: Counterparty Credit Risk, Funding, Collateral, and Capital, 4th Edition (West Sussex, UK: John Wiley & Sons, 2020). Chapter 17 – CVA

Stress Testing: Approaches, Methods, and Applications, Edited by Akhtar Siddique and Iftekhar Hasan (London: Risk Books, 2013). Chapter 4 - The Evolution of Stress Testing Counterparty Exposures

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

Calculate the DVA and explain how stressing DVA enters into aggregating stress tests of CCR.

29. A risk analyst estimates that the hazard rate for a company is 0.12 per year. Assuming a constant hazard rate model, what is the probability that the company will survive in the first year and then default before the end of the second year?

A. 8.9%
B. 10.0%
C. 11.3%
D. 21.3%

Correct Answer: B

Explanation: B is correct.

The joint probability of survival up to time t and default over (t, t+ τ) is:

$P[t^* > t \cap t^* < t+\tau] = 1-e^{-\lambda(t+\tau)}-(1-e^{-\lambda t}) = e^{-\lambda t}(1-e^{-\lambda \tau})$

The joint probability of survival the first year and defaulting in the second year is:

$P[t^* > 1 \cap t^* < 1+1] = e^{-0.12*1}(1-e^{-0.12*1}) = 10.03\%$

Section: Credit Risk Measurement and Management

Reference: Allan Malz, Financial Risk Management: Models, History, and Institutions (Hoboken, NJ: John Wiley & Sons, 2011). Chapter 7 - Spread Risk and Default Intensity Models

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

Distinguish between cumulative and marginal default probabilities.

30. A senior risk analyst at a large investment bank is proposing to the CRO a plan to improve the efficiency of the bank's risk measurement system. The analyst suggests simplifying the bank's portfolio VaR estimation process by mapping the bank's large number of trading positions to a small number of elementary risk factors. Which of the following is the most appropriate way of mapping the given position?

A. Mapping USD/EUR forward contracts to the USD/EUR spot exchange rate

B. Mapping each position in a corporate bond portfolio to the bond with the closest maturity among a set of government bonds

C. Mapping zero-coupon government bonds to government bonds paying regular coupons

D. Mapping zero-coupon government bonds to government bonds paying regular coupons

Correct Answer: A

Explanation: A is correct. Mapping several USD/EUR forward contracts to USD/EUR spot exchange rate is an adequate process, because all the forward positions are exposed to a single major risk factor, which is the USD/EUR spot exchange rate. However, this is not a perfect mapping (for instance, the sensitivity of both the forward and the spot exchange rates to a specific risk factor such as changes in interest rates, may differ).

While the single aggregation of exposure of this risk factor is acceptable for risk measurement, it is not adequate for pricing of the portfolio.

B is incorrect because any bond must be mapped on yields that best represent its current profile and the yield differences between the corporate bonds and the government bonds disqualify this as the best mapping.

C is incorrect because such procedure maps a simple single source of uncertainty (the payoff at the maturity) to multiple sources of uncertainty (coupon payments and the payoff at the maturity) which violates the first principle of mapping, simplify the source of uncertainty.

D is also incorrect as the stock market index is a more diversified factor than a single stock. In fact, it is usually the reverse, i.e., a position of stock within an index is mapped to a position in that index.

Section: Market Risk Measurement and Management

Reference: Philippe Jorion, Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition (New York: McGraw-Hill, 2007). Chapter 11 - VaR Mapping

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

31. An analyst at bank LKS has been asked to validate the bank's VaR model through backtesting. The analyst uses two sets of returns data to generate results of predicted and actual losses that can be compared in the validation process. Which of the following correctly describes the two most appropriate sets of returns data to use in backtesting?

A. The cleaned returns, which are the actual returns minus any profit and loss from intraday trades, and the actual returns, which correspond to the total returns on the bank's trading portfolio

B. The actual returns, which correspond to the total return on the bank's trading portfolio, and the hypothetical returns, which represent the returns obtained from freezing the starting positions in the bank's trading portfolio

C. The hypothetical returns, which represent the returns obtained from freezing the starting positions in the bank's trading portfolio, and the cleaned returns, which are the actual returns minus any profit and loss from intraday trades

D. The trading returns, which are the actual returns minus any fees and commissions, and the hypothetical returns, which represent the actual returns obtained from freezing the starting positions in the bank's trading portfolio

Correct Answer: B

Explanation: B is correct. Ideally, the analyst will use both the actual and hypothetical returns for backtesting since both yield informative comparisons. If the model passes backtesting with hypothetical but not actual returns, the problem in the model lies with intraday trading. If the model does not pass backtesting with hypothetical returns, the modelling methodology should be re-examined.

A is incorrect. The descriptions of the cleaned returns are not correct, and these are not the correct two sets of returns that the analyst should use. Cleaned returns will also subtract any fees, commissions, net interest margin from actual returns. The correct definition of cleaned returns can sometimes be used as an approximation of hypothetical returns, but not the incorrectly defined returns stated here.

C is incorrect. These are not the correct two sets of returns that the analyst should use, and the description of cleaned returns is incorrect.

D is incorrect. There is not a return set that is called trading returns.

Section: Market Risk Measurement and Management

Reference: Phillipe Jorion, Value at Risk: The New Benchmark for Managing Financial Risk, Third Edition. Excerpt of Chapter 6: Backtesting VaR.

Learning Objective: Describe backtesting and exceptions and explain the importance of backtesting VaR models.

32. A financial analyst is pricing a 5-year call option on a 5-year Treasury note using a successfully validated pricing model. Current interest rate volatility is high, and the analyst is concerned about the effect this may have on short-term rates when pricing the option. Which of the following actions would best address the potential for negative short-term interest rates to arise in the model?

A. When short-term rates are negative, the financial analyst adjusts the risk-neutral probabilities.
B. When short-term rates are negative, the financial analyst increases the volatility.
C. When short-term rates are negative, the financial analyst sets the rate to zero.
D. When short-term rates are negative, the financial analyst sets the mean-reverting parameter to 1.

Correct Answer: C

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

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

Section: Market Risk Measurement and Management

Reference: Bruce Tuckman and Angel Serrat, Fixed Income Securities, 3rd Edition (Hoboken, NJ: John Wiley & Sons, 2011). Chapter 9 - The Art of Term Structure Models: Drift

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

33. A risk analyst at an investment bank is evaluating the bank's risk measurement process. The bank currently uses VaR as its primary risk measure, but the analyst believes ES may be a better measure to use during periods of market turmoil. When comparing VaR and ES, which of the following statements is correct?

A. For the same confidence level, ES is always greater than VaR.

B. If a VaR backtest at a specified confidence level is accepted, then the corresponding ES will always be accepted.

C. While VaR ensures that the estimate of portfolio risk is less than or equal to the sum of the risks of that portfolio's positions, ES does not.

D. While ES is more complicated to calculate than VaR, it is easier to backtest than VaR.

Correct Answer: A

Explanation: A is correct. Expected shortfall is always greater than or equal to VaR for a given confidence level α, since α measures the minimum loss in case the worst α probability event happens and ES accounts for the severity of expected losses beyond VaR.

B is incorrect. The VaR backtest acceptance does not guarantee the correctness of the ES calculation.

C is incorrect. VaR is not subadditive. ES is subadditive.

D is incorrect. Backtesting ES is more complicated because while VaR backtesting deals with the number of VaR violations, ES backtesting also deals with the magnitude of such violations.

Section: Market Risk Measurement and Management

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

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

34. A derivative trading desk at a bank decides that its existing VaR model, which has been used broadly across the firm for several years, is too conservative. The existing VaR model uses a historical simulation over a 3-year look-back period, weighting each day equally. A quantitative analyst in the group quickly develops a new VaR model, which uses the delta-normal approach. The new model uses volatilities and correlations estimated over the past 4 years using the RiskMetrics EWMA method.

For testing purposes, the new model is used in parallel with the existing model for 6 weeks to estimate the 1-day 99% VaR. After 6 weeks, the new VaR model has no exceedances despite consistently estimating VaR to be considerably lower than the existing model's estimates. The analyst argues that the lack of exceedances shows that the new model is unbiased and pressures the bank's model evaluation team to agree. Following an overnight examination of the new model by one junior analyst, instead of the customary evaluation that takes several weeks and involves a senior member of the team, the model evaluation team agrees to accept the new model for use by the desk.

Which of the following statements is a correct conclusion for this replacement?

A. Delta-normal VaR is more appropriate than historical simulation VaR for assets with non-linear payoffs.

B. Changing the look-back period and weighting scheme from 3 years, equally weighted, to 4 years, exponentially weighted, will understate the risk in the portfolio.

C. Overnight examination by the junior analyst increased the desk's exposure to model risk due to the potential for incorrect calibration and programming errors.

D. A 99% VaR model that generates no exceedances in 6 weeks is necessarily conservative.

Correct Answer: C

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

Section: Operational Risk and Resiliency

Reference: Allan Malz, Financial Risk Management: Models, History, and Institutions (Hoboken, NJ: John Wiley & Sons, 2011). Chapter 11 - Assessing the Quality of Risk Measures

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

35. The senior management team of a small regional bank has established a committee to review procedures and implement best practices related to entering into significant contracts with third-party vendors. The committee is reviewing one proposed relationship with a third-party vendor who would have a significant responsibility for marketing the bank's financial products to potential customers. In establishing policies to reduce the operational risk associated with this potential vendor contract, which of the following recommendations would be most appropriate?

A. The bank should review all third-party audit reports of the vendor that are publicly available.

B. The bank should ensure that the vendor's sales representatives are compensated mainly with commissions from the sale of the bank's products.

C. The bank should prevent the third-party vendor from having access to any of its critical processes.

D. The bank should be responsible for developing the vendor's contingency planning process to mitigate risk exposure to the vendor.

Correct Answer: A

Explanation: A is correct. From the guidelines regarding internal controls: "For significant service provider relationships, financial institutions should assess the adequacy of the provider's control environment. Assessments should include reviewing available audits or reports such as the American Institute of Certified Public Accountants' Service Organization Control 2 report."

B is incorrect. The bank should review the vendor's incentive compensation structure and ensure that the structure does not encourage vendor sales representatives to direct customers towards higher margin products without regard for the risk incurred.

Compensating sales reps mostly with commissions would not be appropriate.

C is incorrect. Outsourcing critical processes is not ruled out as a guideline, for example: "A community banking organization may have critical business activities being outsourced, but the number may be few and to highly reputable service providers." "(Larger) financial institutions may use hundreds or thousands of service providers for numerous business activities that have material risk…"

D is incorrect. The bank should monitor the vendor's contingency planning process and "assess the adequacy and effectiveness of a service provider's disaster recovery and business continuity plan and its alignment with its own plan".

Section: Operational Risk and Resiliency

Reference: "Guidance on Managing Outsourcing Risk," Board of Governors of the Federal Reserve System, December 2013

Learning Objective: Describe topics and provisions that should be addressed in a contract with a third-party service provider.

36. The Basel Committee recommends that banks use a set of early warning indicators to identify emerging risks and potential vulnerabilities in their liquidity position. Which of the following is an early warning indicator of a potential liquidity problem?

A. Credit rating upgrade
B. Increased asset diversification
C. Rapid growth in the leverage ratio with significant dependence on short-term repo financing
D. Decreased collateral haircuts applied to the bank's collateralized exposures

Correct Answer: C

Explanation: C is correct. Rapid levered asset growth combined with substantial use of short-term repos is an early warning of a potential liquidity problem. Decreased collateral haircuts, a credit rating upgrade, and increased asset diversification are generally positive developments and not early warnings of a potential liquidity problem.

Section: Liquidity and Treasury Risk

Reference: Shyam Venkat and Stephen Baird, Liquidity Risk Management: A Practitioner's Perspective (John Wiley & Sons, 2016). Chapter 6 - Early Warning Indicators.

Learning Objective: Identify EWI guidelines from banking regulators and supervisors (OCC, BCBS, Federal Reserve).

37. Large dealer banks have often financed significant fractions of their assets using short-term (overnight) repurchase agreements in which creditors hold bank securities as collateral against default losses. The table below shows the quarter-end financing of four A-rated broker-dealer banks. All values are in USD billion.

Financial instruments	Bank P	Bank Q	Bank R	Bank S
Owned	656	750	339	835
Pledged as collateral	258	472	139	209
Not pledged	398	278	200	626

In the event that repo creditors become equally nervous about each bank's solvency, which bank is most vulnerable to a liquidity crisis?

A. Bank P

B. Bank Q

C. Bank R

D. Bank S

Correct Answer: B

Explanation: B is correct. A liquidity crisis could materialize if repo creditors become nervous about a bank's solvency and choose not to renew their positions. If enough creditors choose not to renew, the bank could likely be unable to raise sufficient cash by other means on such short notice, thereby precipitating a crisis. The bank may therefore be forced to sell its assets in a hurry to buyers that know it needs to sell quickly. This leads to the potential for a fire sale and supports using the proportion of assets covered by repos as a signal of liquidity risk. Also, low prices recorded in a fire sale could lower the market valuation of securities not sold, and thus reduce the amount of cash that could be raised through repurchase agreements collateralized by those securities. Overall, this vulnerability is directly related to the proportion of assets a bank has pledged as collateral.

Bank Q is most vulnerable since it has the largest dependence on short-term repo financing (i.e. the highest percentage of its assets out of the four banks is pledged as collateral.

Section: Liquidity and Treasury Risk

Reference: Darrell Duffie, The Failure Mechanics of Dealer Banks, Journal of Economic Perspectives (2010, Volume 24, Number 1), pp. 51-72

Learning Objective: Identify situations that can cause a liquidity crisis at a dealer bank and explain responses that can mitigate these risks.

38. During a training seminar, a supervisor at Firm W discusses different types of operational risk that the firm may face, which could be in the short-term or over a longer-term period. Which of the following is an example of a loss caused by an operational risk of Firm W?

A. After a surprise announcement by the central bank that interest rates would increase, bond prices fall and Firm W incurs a significant loss on its bond portfolio.

B. The data capture system of Firm W fails to capture the correct market rates causing derivative trades to be transacted at incorrect prices, resulting in significant losses.

C. As a result of an increase in commodity prices, the share price of a company that Firm W invested in falls significantly, causing major investment losses.

D. A counterparty of Firm W fails to settle its debt to Firm W, and in doing this, it is in breach of a legal agreement to pay for services rendered.

Correct Answer: B

Explanation: B is correct. In B, systems failure or incorrect systems caused the problem. The losses are directly due to an operational risk exposure. In A and C, an increase in interest rates and the fall in the value of an investment, respectively, are both examples of market risk exposure. In D, failure to repay debt is an example of credit risk exposure.

Section: Operational Risk and Resiliency

Reference: “Revisions to the Principles for the Sound Management of Operational Risk,” (Basel Committee on Banking Supervision Publication, March 2021)

Learning Objective: Describe tools and processes that can be used to identify and assess operational risk.

39. A bank owned several retail branch buildings that were destroyed in a hurricane. A financial analyst at the bank wants to determine the correct costs to include in reporting this loss in its operational risk event database. Which of the following costs associated with this loss should be included in the operational loss report?

A. Costs of insurance premiums paid to insure the buildings before the storm took place

B. A provision for the estimated opportunity costs of lost banking business at the affected branches

C. Legal costs paid to obtain construction permits to rebuild the destroyed branch buildings

D. Costs of a program to train branch managers on ways to prepare buildings to mitigate potential damage from future hurricanes

Correct Answer: C

Explanation: C is correct. Most costs associated with an operational loss should be included, however, there are several categories of costs which should not be (such as opportunity costs, forgone revenue, and costs related to risk management and control enhancements implemented to prevent future operational losses.) Known legal costs incurred as a result of the loss should be included as part of the report.

A is incorrect because costs of insurance are paid in advance. Insurance is purchased to protect the firm against potential operational losses but at the time insurance is purchased, the potentially insurable event (the hurricane) has not happened yet. Therefore, the insurance costs should not be included in the loss report.

B is incorrect because the guidelines specifically prohibit provisions for opportunity costs, i.e., the cost of lost business due to the operational loss event.

D is incorrect because “provisions should not include costs, such as retraining or relocating continuing staff” and should not include “costs related to risk management and control enhancements implemented to prevent future operational losses”.

Section: Operational Risk and Resiliency

Reference: Marcelo G. Cruz, Gareth W. Peters, and Pavel V. Shevchenko, Fundamental Aspects of Operational Risk and Insurance Analytics: A Handbook of Operational Risk (Hoboken, NJ: John Wiley & Sons, 2015). Chapter 2 – OpRisk Data and Governance

Learning Objective: Summarize the process of collecting and reporting internal operational loss data, including the selection of thresholds, the timeframe for recoveries and reporting expected operational losses.

40. A risk analyst is implementing an enterprise risk management system at a bank. During the process, the analyst takes an inventory of risks faced by the bank and categorizes these risks as market, credit, or operational risks. Which of the following observations of the bank's data should be considered unexpected if compared to similar industry data?

A. The operational risk loss distribution has many small losses, and therefore a relatively low mode.

B. The operational risk loss distribution is symmetric and fat-tailed.

C. The credit risk distribution is asymmetric and fat-tailed.

D. The market risk distribution is symmetric.

Correct Answer: B

Explanation: B is correct. Statements A, C, and D are consistent with industry data. However, with operational risk, there tends to be large numbers of small losses and a small number of large losses, so the distribution is asymmetric (and fat-tailed).

Section: Operational Risk and Resiliency

Reference: Brian Nocco and René Stulz, Enterprise Risk Management: Theory and Practice, Journal of Applied Corporate Finance (Volume 18, Number 4, 2006), pp. 8 – 20

Learning Objective: Describe the development and implementation of an ERM system, as well as challenges to the implementation of an ERM system.

41. A regional commercial bank is considering a 1-year loan to be fully funded by deposits, with the following parameters:

- Loan amount: JPY 4.2 billion
- Average annual interest rate paid on deposits: 0.4%
- Annual interest rate received on loan: 3.2%
- Expected loss: 2.0% of face value of loan
- Annual operating costs: 0.5% of face value of loan
- Economic capital required to support the loan: 10.0%
- Average pre-tax return on economic capital: 1.4%
- Effective tax rate: 38%
- Other transfer costs: JPY 0

What is the after-tax RAROC for this loan?

A. 0.27%
B. 2.73%
C. 4.40%
D. 10.73%

Correct Answer: B

Explanation: B is correct. The risk-adjusted after-tax return on capital (RAROC) is computed by:

$$RAROC = \frac{After - tax\ expected\ risk - adjusted\ net\ income}{Economic\ capital}$$

$$= \frac{ER + ROEC - IC - OC - EL - Taxes \pm Transfers}{Economic\ capital}$$

where,

Economic capital = JPY 4,200,000,000 x 0.10 = JPY 420,000,000

ER = expected revenue = JPY 4,200,000,000 x 0.032 = JPY 134,400,000

ROEC = pre-tax return on invested economic capital =

=Economic capital x 0.014 = JPY 420,000,000 x 0.014 = JPY 5,880,000

IC = interest expense = JPY 4,200,000,000 x 0.004 = JPY 16,800,000

OC = Operating Cost = JPY 4,200,000,000 x 0.005 = JPY 21,000,000

EL = expected loss = JPY 4,200,000,000 x 0.02 = JPY 84,000,000

Taxes = (Revenue + Income – Interest – Operating Cost – Loss)*(Tax rate)

= (134,400,000 + 5,880,000 – 16,800,000 – 21,000,000 – 84,000,000)*(0.38)

= (JPY 18,480,000)*(0.38) = JPY 7,022,400

Therefore, numerator = JPY 11,457,600 and so,

$$RAROC = \frac{11{,}457{,}600}{420{,}000{,}000} = 0.0273 = 2.73\%$$

A is incorrect. 0.27% is the result obtained when the economic capital is incorrectly taken to be JPY 4.2 billion instead of it being 10% of the loan amount.

C is incorrect. 4.40% is the result obtained when taxes are ignored.

D is incorrect. 10.73% is the result obtained when IC is added instead of subtracting in the numerator.

Section: Operational Risk and Resiliency

Reference: Michel Crouhy, Dan Galai and Robert Mark, The Essentials of Risk Management, 2nd Edition (New York: McGraw-Hill, 2014). Chapter 17 - Risk Capital Attribution and Risk-Adjusted Performance Measurement

Learning Objective: Compute and interpret the RAROC for a project, loan, or loan portfolio and use RAROC to compare business unit performance.

42. A bank is using the VaR and stressed VaR market risk framework in line with the Basel II.5 guidelines. The bank's internal models for market risk have generated the following risk measures (in USD million) for the current trading book positions:

Confidence level	Latest available 10-day VaR	Latest available 10-day stressed VaR	Average 10-day VaR of previous 60 days	Average 10-day stressed VaR of previous 60 days
95.0%	238	484	252	546
99.0%	451	995	413	1,106
99.9%	578	1,281	528	1,372

Assuming the supervisory authority has set the multiplication factors for both the VaR and the stressed VaR values to 3, what is the correct capital requirement for general market risk for the bank under Basel II.5?

A. USD 1,248 million

B. USD 1,533 million

C. USD 4,557 million

D. USD 4,799 million

Correct Answer: C

Explanation: C is correct. The Basel II.5 market risk capital requirement requires a 99.0% confidence level and is calculated as follows: Market Risk Capital =

$= \max(VaR_{t-1}, m_c * VaR_{60\text{-day Avg}}) + \max(sVaR_{t-1}, m_s * sVaR_{60\text{-day Avg}})$

= max(451, 3*413) + max(995, 3*1,106)

= USD 1,239 million + USD 3,318 million

= USD 4,557 million

Section: Operational Risk and Resiliency

Reference: Mark Carey, "Solvency, Liquidity and Other Regulation After the Global Financial Crisis," GARP Risk Institute, April 2019

Learning Objective: Describe and calculate the stressed VaR introduced in Basel 2.5 and calculate the market risk capital charge.

43. Company PQR has an outstanding zero-coupon bond with 1 year remaining to maturity. The bond, the company's only debt, has a face value of USD 2,000,000 and a recovery rate of 0% in the event of default. The bond is currently trading at 75% of face value. Assuming the excess spread only captures credit risk and that the continuously-compounded risk-free rate is 3% per year, and using risk-neutral binomial tree methodology, what is the approximate risk-neutral 1-year probability of default of Company PQR?

A. 13.3%

B. 16.5%

C. 19.2%

D. 22.7%

Correct Answer: D

Explanation: D is correct.

As the bond is trading at 75% of the current value, the bond price for face value USD 2M is 0.75*2 = USD 1.5M. The risk-neutral argument equates the risk-free investment payoff in 1 year to the expected risk-neutral payoff, i.e.,

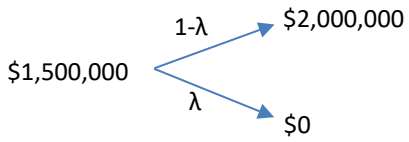
$1.5 * \exp(0.03*1) = 0 * PD + 2 * (1 - PD)$

where PD is the risk-neutral probability of default. Thus,

$PD = 1 - [1.5 * \exp(0.03) / 2] = 0.227$

Easier explanation:

Risk-neutral probability of default (λ)



$1{,}500{,}000 = [(1-\lambda)*2{,}000{,}000 + \lambda*0]*e^{-3\%*1}$

and thus $\lambda = 22.72\%$

Section: Market Risk Measurement and Management

Reference: Bruce Tuckman and Angel Serrat, Fixed Income Securities, 3rd Edition (Hoboken, NJ: John Wiley & Sons, 2011). Chapter 8 - The Evolution of Short Rates and the Shape of the Term Structure

Learning Objective: Calculate the price and return of a zero-coupon bond incorporating a risk premium.

44. As part of a broader assessment of migration risk, a risk analyst at a rating agency examines the observed defaults of a given rating class of corporate issuers. The rating class contained 348 names (number of issuers) at the end of 2016, which was the time of origination. The number of issuers that have not defaulted over the past 3 years is shown in the table below:

Year	Number of non-defaulted names at end of year
2016	348
2017	339
2018	333
2019	329

Assuming no new issuers were added to the rating class throughout the holding period, what is the estimate of the 1-year marginal probability of default in the year 2019?

A. 1.15%

B. 1.20%

C. 1.72%

D. 1.77%

Correct Answer: A

Explanation: A is correct. The estimate of the marginal probability of default between year-end 2018 and year-end 2019 = cumulative default rate in 2019 less the cumulative default rate in 2018 = 5.46 – 4.31 = 1.15%.

The correct calculations are shown in the table below for the cumulative proportion of default ($PD_{t,\ cumulative}$), and the estimate of the marginal probability of default ($PD_{t+k,\ marginal}$):

End of year (t)	2016(0)	2017(1)	2018(2)	2019(3)
Number of issuers (Names)	348	339	333	329
Number of defaults	0	9	6	4
Cumulative defaults (t)		9	15	19
$PD_{t,cumulative}$ (%)		2.59	4.31	5.46
$PD_{k,marginal}$ (%)		2.59	1.72	1.15

where:

$$PD_{k,cumulative} = \frac{Cumulative\ Default_{t,t+k}}{Names_{t=0}}$$

$$PD_{k,\mathrm{marginal}} = PD_{t+k,cumulative} - PD_{t,cumulative}$$

B is incorrect. 1.20% is the 1-year conditional default rate in 2019 (=4/333 = 1.20%).

C is incorrect. 1.72% (= 4.31 – 2.59) is the estimate of the annual marginal probability of default between year 2017 and year 2018.

D is incorrect. 1.77% is the 1-year conditional default rate in 2018 (= 6/339 = 1.77%).

Section: Credit Risk Measurement and Management

Reference: Giacomo De Laurentis, Renato Maino, and Luca Molteni, Developing, Validating and Using Internal Ratings (West Sussex, United Kingdom: John Wiley & Sons, 2010). Chapter 3 - Rating Assignment Methodologies

Learning Objective: Describe a rating migration matrix and calculate the probability of default, cumulative probability of default, marginal probability of default and annualized default rate.

45. A financial institution has four open derivative positions with an investment company. A description of the positions and their current market values are displayed in the table below:

Position	Exposure (USD)
Long swaptions	32 million
Long credit default swaps	12 million
Long currency derivatives	-16 million
Long futures contracts	-8 million

If the investment company defaults, what would be the loss to the financial institution if netting is used compared to the loss if netting is not used?

A. Loss of USD 20 million if netting is used; loss of USD 24 million if netting is not used

B. Loss of USD 20 million if netting is used; loss of USD 44 million if netting is not used

C. Loss of USD 24 million if netting is used; loss of USD 32 million if netting is not used

D. Loss of USD 20 million if netting is used; loss of USD 24 million if netting is not used

Correct Answer: B

Explanation: B is correct. Netting means that the payments between the two counterparties are netted out, so that only a net payment has to be made. With netting, the investment firm is not required to make every payout, hence the loss will be reduced to: USD 32 million + USD 12 million – USD 16 million – USD 8 million = USD 20 million. Without netting, the loss is the outstanding long position: USD 32 million + USD 12 million = USD 44 million..

Section: Credit Risk Measurement and Management

Reference: Jon Gregory, The xVA Challenge: Counterparty Credit Risk, Funding, Collateral, and Capital, 4th Edition (West Sussex, UK: John Wiley & Sons, 2020). Chapter 6, Netting, Close-out, and Related Aspects

Learning Objective: Describe the effectiveness of netting in reducing credit exposure under various scenarios.

46. A derivative trading firm sells a European-style call option on stock JKJ with a time to expiration of 9 months, a strike price of EUR 45, an underlying asset price of EUR 67, and implied annual volatility of 27%. The annual risk-free interest rate is 2.5%. What is the trading firm's counterparty credit exposure from this transaction?

A. EUR 0

B. EUR 9.45

C. EUR 19.63

D. EUR 22.00

Correct Answer: A

Explanation: A is correct. Selling an option exposes the firm to zero counterparty credit risk as the premium is paid up front. However, buying an option would expose the firm to a counterparty credit risk. All the pieces of information necessary to price the option are provided but they are not necessary for answering the question.

Section: Credit Risk Measurement and Management

Reference: Jon Gregory, The xVA Challenge: Counterparty Credit Risk, Funding, Collateral, and Capital, 4th Edition (West Sussex, UK: John Wiley & Sons, 2020). Chapter 3 – Counterparty Risk and Beyond

Learning Objective: Describe transactions that carry counterparty risk and explain how counterparty risk can arise in each transaction.

47. A financial firm has sold default protection on the most senior tranche of a CDO. If the default correlation between assets held in the CDO decreases sharply from the correlation used in pricing the CDO tranches, assuming everything else is unchanged, how will the position of the financial firm be impacted?

A. It will either increase or decrease, depending on the pricing model used and the market conditions.

B. It will gain significant value, since the probability of exercising the protection falls.

C. It will lose significant value, since the protection will gain value.

D. It will neither gain nor lose value, since only expected default losses matter and correlation does not affect expected default losses.

Correct Answer: B

Explanation: B is correct. The senior tranche will gain value if the default correlation decreases. High correlation implies that if one name defaults, a large number of other names in the CDO will also default. Low correlation implies that if one name defaults, there would be little impact on the default probability of the other names. Therefore, as the correlation decreases, the cumulative probability of enough defaults occurring to exceed the credit enhancement on the senior tranche will also decrease. Hence the investor who has sold protection on the senior tranche will see a gain.

Section: Credit Risk Measurement and Management

Reference: Allan Malz, Financial Risk Management: Models, History, and Institutions (Hoboken, NJ: John Wiley & Sons, 2011). Chapter 9 - Structured Credit Risk

Learning Objective: Explain how the default probabilities and default correlations affect the credit risk in a securitization.

48. A risk analyst constructs a binomial interest rate tree by using the Ho-Lee model. The time step is monthly and the annualized drift is 80 bps in the first month and 120 bps in the second month. Assuming the current annualized short-term rate is 3.2% and the annual basis point-volatility is 2.1%, what is the interest rate in the lowest node after 2 months?

A. 1.82%

B. 2.15%

C. 2.76%

D. 3.03%

Correct Answer: B

Explanation: B is correct. The interest rate in the lowest node based on the Ho-Lee model is:

$$r_0 + (\lambda_1 + \lambda_2)dt - 2\sigma\sqrt{dt}$$

$$= 3.2\% + \frac{(0.8\% + 1.2\%)}{12} - 2 * 2.1\% * \sqrt{\frac{1}{12}}$$

$$= 0.021542 = 2.15\%$$

A is incorrect. This uses the incorrect formula $r_0 - (\lambda_1 + \lambda_2)dt - 2\sigma\sqrt{dt}$ dt to calculate the interest rate, subtracting instead of adding the second term in the formula.

C is incorrect. This uses the incorrect formula $r_0 + (\lambda_1 + \lambda_2)dt - \sigma\sqrt{dt}$ to calculate the interest rate, forgetting to multiply by 2 in the third term.

D is incorrect. This uses the incorrect formula $r_0 - (\lambda_1 + \lambda_2)dt$ to calculate the interest rate, omitting the third term entirely.

Section: Market Risk Measurement and Management

Reference: Bruce Tuckman and Angel Serrat, Fixed Income Securities, 3rd Edition (Hoboken, NJ: John Wiley & Sons, 2011). Chapter 9 – The Art of Term Structure Models: Drift

Learning Objective: Construct a short-term rate tree under the Ho-Lee Model with time-dependent drift.

49. A junior risk analyst at a consulting firm is reviewing the operational arrangements of bilateral netting and central clearing of derivative trades. The analyst examines the following bilateral trades of three firms:

- Firm 1's exposure to Firm 2: AUD 90 million
- Firm 2's exposure to Firm 1: AUD 60 million
- Firm 1's exposure to Firm 3: AUD 12 million
- Firm 3's exposure to Firm 1: AUD 70 million
- Firm 2's exposure to Firm 3: AUD 57 million
- Firm 3's exposure to Firm 2: AUD 0 million

Which of the following statements is correct?

A. Under bilateral netting, Firm 1's net exposure is AUD 28 million.

B. Under bilateral netting, Firm 2's net exposure is AUD 27 million.

C. Under central clearing, Firm 3's net exposure is AUD 0 million.

D. Under central clearing, the CCP's net exposure is AUD 28 million.

Correct Answer: D

Explanation: D is correct. The CCP's net exposure is AUD 28 million under central clearing. We express the positions – through the process of novation and netting – and present the results shown both in the table and the explanations below (note that a negative net exposure means a zero exposure):

Party	No Netting	Bilateral Netting	Central Clearing
Firm 1	90 + 12 = 102	90-60 + 12-70 = 30 + -58 = 30	90-60 + 12-70 = 30 -58 = -28 = 0
Firm 2	60 + 57 = 117	60-90 + 57-0 = -30 + 57 = 57	60-90 + 57-0 = -30 + 57 = 27
Firm 3	70	70-12 + 0-57 = 58 + -57 = 58	70-12 + 0-57 = 58-57 = 1
CCP	--	--	27 + 1 = 28
Total	**289**	**145**	**56**

- Firm 1's exposure to CCP = 90 + 12 = AUD 102 million; CCP's exposure to Firm 1 = 60 + 70 = AUD 130 million Hence, Firm 1's exposure to CCP = AUD 0 million (= 102m – 130m = -28m = 0).
- Firm 3's exposure to CCP = AUD 70 million; CCP's exposure to Firm 3 = 12 + 57 = AUD 69 million Hence, Firm 3's exposure to CCP = AUD 1 million (= 70m – 69m).
- Firm 2's exposure to CCP = 60 + 57 = AUD 117 million; CCP's exposure to Firm 2 = AUD 90 million Hence, CCP's exposure to Firm 2 = AUD 27 million (= 117m – 90m).

A is incorrect. Firm 1 has a net exposure of AUD 30 million under bilateral netting as shown above.

B is incorrect. Firm 2 has a net exposure of AUD 57 million under bilateral netting as shown above.

C is incorrect. Firm 3 has a net exposure of AUD 1 million under central clearing as shown above.

Section: Credit Risk Measurement and Management

Reference: Jon Gregory, The xVA Challenge: Counterparty Credit Risk, Funding, Collateral, and Capital, 4th Edition (West Sussex, UK: John Wiley & Sons, 2020). Chapter 6 - Netting, Close-out, and Related Aspects

Learning Objective: Describe the effectiveness of netting in reducing credit exposure under various scenarios.

50. A credit analyst is evaluating the liquidity of a small regional bank while preparing a report for a credit committee meeting. With quarterly financial statements, the analyst calculates some relevant liquidity indicators over the past three years. Which of the following trends over this period should the analyst be most concerned about in the credit risk report?

A. The bank's average net federal funds and repurchase agreements position has been increasing.
B. The bank's capacity ratio has been increasing.
C. The bank's pledged securities ratio has been decreasing.
D. The bank's loan commitments ratio has been decreasing.

Correct Answer: B

Explanation: B is correct. Capacity ratio is the ratio of net loans and leases to total assets, so liquidity decreases when net loans and leases increase relative to total assets, because they are often illiquid.

A is incorrect. Liquidity increases when overnight loans increase relative to overnight borrowing.

C is incorrect. Liquidity increases when fewer securities are pledged/unavailable to sell relative to total securities.

D is incorrect. Liquidity increases when loan commitments decreases relative to total assets.

Section: Liquidity and Treasury Risk

Reference: Peter Rose, Sylvia Hudgins, Bank Management & Financial Services, 9th Edition (McGraw-Hill Companies, Inc., 2013). Chapter 11 - Liquidity and Reserve Management: Strategies and Policies

Learning Objective: Estimate a bank's liquidity needs through three methods (sources and uses of funds, structure of funds, and liquidity indicators)

51. A risk analyst is examining a firm's foreign currency option pricing assumptions. The implied volatility is relatively low for an at-the-money option and it becomes progressively higher as the option moves either in-the-money or out-of-the-money. How does the distribution of option prices on this foreign currency implied by the Black-Scholes-Merton model compare to the lognormal distribution with the same mean and standard deviation?

A. It has a heavier left tail and a less heavy right tail.

B. It has a heavier left tail and a heavier right tail.

C. It has a less heavy left tail and a heavier right tail.

D. It has a less heavy left tail and a less heavy right tail.

Correct Answer: B

Explanation: B is correct. For a foreign currency option, the implied distribution gives a relatively high price for the option. The implied volatility is relatively low for at-the-money options, but it becomes higher as the option moves either in-the-money or out-of-the-money. Thus, the implied distribution has heavier tails than the lognormal distribution.

Section: Market Risk Measurement and Management

Reference: John Hull, Options, Futures, and Other Derivatives, 10th Edition (New York: Pearson, 2017). Chapter 20 - Volatility Smiles

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

52. A wealth management firm has JPY 72 billion in assets under management. The portfolio manager computes the daily VaR at various confidence levels as follows:

Confidence Level	VaR (USD)
95.0%	332,760,000
95.5%	336,292,500
96.0%	340,095,000
96.5%	350,332,500
97.0%	359,107,500
97.5%	367,882,500
98.0%	378,412,500
98.5%	392,452,500
99.0%	410,880,000
99.5%	439,252,500

What is the closest estimate of the daily ES at the 97.5% confidence level?

A. JPY 398 million

B. JPY 400 million

C. JPY 405 million

D. JPY 497 million

Correct Answer: C

Explanation: C is correct. An estimate of the expected shortfall (ES) can be obtained by taking the average of the VaRs for the various confidence levels that are greater than 97.5%. Therefore,

ES = (378,412,500+392,452,500+410,880,000+439,252,500)/4 = JPY 405,249,375

Section: Market Risk Measurement and Management

Reference: Kevin Dowd, Measuring Market Risk, 2nd Edition (West Sussex, England: John Wiley & Sons, 2005). Chapter 3 - Estimating Market Risk Measures: An Introduction and Overview

Learning Objective: Estimate the expected shortfall given profit and loss (P/L) or return data.

53. A newly hired risk analyst at an investment bank is assisting in backtesting the bank's VaR model. Currently, the 1-day VaR is estimated at the 95% confidence level but the bank is considering a change to estimating 1-day VaR at the 99% confidence level, as recommended in the Basel framework. Which of the following statements regarding this change is correct?

A. The decision to accept or reject a VaR model based on backtesting results at the two-tailed 95% confidence level is less reliable using a 99% VaR model than using a 95% VaR model.

B. The 95% VaR model is less likely to be rejected using backtesting than the 99% VaR model.

C. When backtesting using a two-tailed 90% confidence level test, there is a smaller probability of incorrectly rejecting a 95% VaR model than a 99% VaR model.

D. Using a 99% VaR model will lower the probability of committing both type 1 and type 2 errors.

Correct Answer: A

Explanation: A is correct. The concept tested here is the understanding of the difference between the VaR parameter for confidence (here, namely 95% vs. 99%) and the validation procedure confidence level (namely 95%), and how they interact with one another.

Using a 95% VaR confidence level creates a narrower nonrejection region than using a 99% VaR confidence level by allowing a greater number of exceptions to be generated. This in turn increases the power of the backtesting process and makes for a more reliable test than using a 99% confidence level.

Section: Market Risk Measurement and Management

Reference: Philippe Jorion, Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition (New York: McGraw-Hill, 2007). Chapter 6 - Backtesting VaR.

Learning Objective: Identify and describe Type I and Type II errors in the context of a backtesting process.

54. A risk manager at a fixed-income hedge fund is evaluating ways to improve the fund's ability to model interest rate term structures. The manager would like to adopt a model that is flexible enough to incorporate mean reversion as well as a risk premium and considers the Vasicek model for this purpose. Which of the following is correct about the Vasicek model?

A. It incorporates the mean reversion feature and its drift is always zero.

B. It incorporates the mean reversion feature and models the risk premium as a component of a constant or changing drift.

C. It cannot incorporate risk premium and its drift is always zero.

D. It cannot capture the mean reversion feature but can be used to model the time-varying risk premium.

Correct Answer: B

Explanation: B is correct. The Vasicek model incorporates mean reversion. The flexibility of the model also allows for risk premium, which enters into the model as constant drift or a drift that changes over time.

Section: Market Risk Measurement and Management

Reference: Bruce Tuckman and Angel Serrat, Fixed Income Securities, 3rd Edition (Hoboken, NJ: John Wiley & Sons, 2011). Chapter 9 - The Art of Term Structure Models: Drift

Learning Objective: Describe the process of constructing a simple and recombining tree for a short-term rate under the Vasicek Model with mean reversion.

55. A newly hired risk analyst at a large investment bank is examining how financial correlation risk affects the bank's portfolios. The bank holds portfolios consisting of different types of assets and enters into various hedging contracts with multiple counterparties. Which of the following statements would the analyst be correct to make?

A. The buyer of a CDS faces wrong-way risk when there is a positive default correlation between the reference asset and the CDS counterparty.

B. The risk-adjusted return of a portfolio typically increases when correlations of assets in the portfolio increase.

C. Dynamic correlation risk in a portfolio of pairs trades is most appropriately estimated using Gaussian copulas.

D. Correlation risk is highest during periods of relatively benign market movements when correlations are difficult to predict.

Correct Answer: A

Explanation: A is correct. Wrong-way risk arises when there is a positive default correlation between the reference asset and the CDS counterparty.

B is incorrect. The lower the correlation between the assets in a portfolio, the higher the return/risk (risk-adjusted returns) ratio.

C is incorrect. Gaussian copulas are used to measure the static default correlation risk of CDOs, they would not be used in a portfolio of pairs trades.

D is incorrect. Periods of systemic crises have the highest correlation risk as the change in correlation is often highest in these crises as correlations move closer to 1.

Section: Market Risk Measurement and Management

Reference: Gunter Meissner, Correlation Risk Modeling and Management, 2nd edition, Risk books, 2019. Chapter 1. Correlation Basics: Definitions, Applications, and Terminology

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

56. A risk committee of the board of company ABC is discussing the difference between pricing deep out-of-the-money call options on ABC stock and pricing deep out-of-the-money call options on the USD/GBP foreign exchange (FX) rate using the Black-Scholes-Merton model. The committee considers pricing each of these two options based on two distinct probability distributions of underlying asset prices at the option expiration date: a lognormal probability distribution, and an implied risk-neutral probability distribution obtained from the volatility smile for each aforementioned option of the same maturity and the same moneyness. If the implied risk-neutral probability distribution is used instead of the lognormal distribution, which of the following is correct?

A. The price of the option on ABC stock would be relatively high and the price of the option on USD/GBP FX rate would be relatively low compared to those computed from the lognormal counterparts.

B. The price of the option on ABC stock would be relatively low and the price of the option on USD/GBP FX rate would be relatively high compared to those computed from the lognormal counterparts.

C. The price of the option on ABC stock would be relatively low and the price of the option on USD/GBP FX rate would be relatively low compared to those computed from the lognormal counterparts.

D. The price of the option on ABC stock would be relatively high and the price of the option on USD/GBP FX rate would be relatively high compared to those computed from the lognormal counterparts.

Correct Answer: B

Explanation: B is correct. The implied distribution of the underlying equity prices derived using the general volatility smile of equity options has a heavier left tail and a less heavy right tail than a lognormal distribution of underlying prices. Therefore, using the implied distribution of prices causes deep-out-of-the-money call options on the underlying to be priced relatively low compared with using the lognormal distribution.

The implied distribution of underlying foreign currency prices derived using the general volatility smile of foreign currency options has heavier tails than a lognormal distribution of underlying prices.

Therefore, using the implied distribution of prices causes deep-out-of-the-money call options on the underlying to be priced relatively high compared with using the lognormal distribution.

Section: Market Risk Measurement and Management

Reference: John Hull, Options, Futures, and Other Derivatives, 10th Edition (New York: Pearson, 2017). Chapter 20 - Volatility Smiles

Learning Objective: Describe characteristics of foreign exchange rate distributions and their implications on option prices and implied volatility.

57. The CRO of a regional bank expresses concern in a risk team meeting that the bank's internal risk models are not adequate in assessing potential random extreme losses. A risk analyst suggests that implementing a model based on extreme value theory (EVT) could address this concern. Which of the following is correct when applying EVT and examining distributions of losses exceeding a threshold value?

A. As the threshold value is increased, the distribution of losses over a fixed threshold value converges to a generalized Pareto distribution.

B. If the tail parameter value of the generalized extreme-value (GEV) distribution goes to infinity, then the GEV essentially becomes a normal distribution.

C. To apply EVT, the underlying loss distribution must be either normal or lognormal.

D. The number of exceedances decreases as the threshold value decreases, which causes the reliability of the parameter estimates to increase.

Correct Answer: A

Explanation: A is correct. A key foundation of EVT is that as the threshold value is increased, the distribution of loss exceedances converges to a generalized Pareto distribution. Assuming the threshold is high enough, excess losses can be modeled using the generalized Pareto distribution. It is known as the Gnedenko–Pickands–Balkema–deHaan (GPBdH) theorem and is heavily used in the peaks-over-threshold (POT) approach.

B is incorrect. If the tail parameter value of the generalized extreme-value (GEV) distribution goes to zero, and not infinity, then the distribution of the original data (not the GEV) could be a light-tail distribution such as normal or log-normal. In other words, the corresponding GEV distribution is a Gumbel distribution.

C is incorrect. To apply EVT, the underlying loss distribution can be any of the commonly used distributions: normal, lognormal, t, etc.

D is incorrect. As the threshold value is decreased, the number of exceedances increases.

Section: Market Risk Measurement and Management

Reference: Kevin Dowd, Measuring Market Risk, 2nd Edition (West Sussex, England: John Wiley & Sons, 2005). Chapter 7 - Parametric Approaches (II): Extreme Value

Learning Objective: Describe extreme value theory (EVT) and its use in risk management.

58. A regulatory analyst at an investment bank is reviewing the Basel Committee rules for backtesting VaR models. The analyst notes that under the Basel framework, a penalty can be given to banks that have more than four exceptions to their 1-day 99% VaR over the last 250 trading days. Which of the following scenarios is most likely to result in a penalty?

A. A large move in interest rates occurs in conjunction with a small move in correlations.

B. The bank's model calculates interest rate risk based on the median duration of the bonds in the portfolio.

C. A sudden market crisis in an emerging market, which leads to losses in the equity positions in that country.

D. A sudden devastating earthquake that causes major losses in the bank's key area of operation.

Correct Answer: B

Explanation: B is correct. In the case of bad luck, no penalty is given, as would be the case for a bank affected by unpredictable movements in rates or markets. However, when risk models are not precise enough, a penalty is typically given since model accuracy could have easily been improved.

Section: Market Risk Measurement and Management

Reference: Philippe Jorion, Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition (New York: McGraw-Hill, 2007). Chapter 6 - Backtesting VaR

Learning Objective: Describe the Basel rules for backtesting.

59. A fund manager owns a portfolio of options on TUV, a non-dividend paying stock. The portfolio is made up of 5,000 deep in-the-money call options on TUV and 20,000 deep out-of-the-money call options on TUV. The portfolio also contains 10,000 forward contracts on TUV. Currently, TUV is trading at USD 52. Assuming 252 trading days in a year, the volatility of TUV is 12% per year, and that each of the option and forward contracts is on one share of TUV, which of the following amounts would be closest to the 1-day 99% VaR of the portfolio?

A. USD 11,557

B. USD 12,627

C. USD 13,715

D. USD 32,000

Correct Answer: C

Explanation: C is correct. We need to map the portfolio to a position in the underlying stock TUV. A deep in-the-money call has a delta of approximately 1, a deep out-of-the-money call has a delta of approximately zero and forwards have a delta of 1.

The net portfolio has a delta (D_p) of about 1*5,000 + 0*20,000 + 1*10,000 = 15,000 and is approximately gamma neutral.

Let:

α = 2.326 (99% confidence level)

S = price per share of stock TUV = USD 52

D_p = delta of the position = 15,000

σ = volatility of TUV = 0.12

Therefore, the 1-day VaR estimate at 99% confidence level is computed as follows:

$\alpha * S * D_p * \sigma * \text{sqrt}(1/T) = (2.326)*(52)*(15,000)*(0.12/\text{sqrt}(252)) = \text{USD } 13,714.67$

Section: Market Risk Measurement and Management

Reference: Philippe Jorion, Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition (New York: McGraw-Hill, 2007). Chapter 11 - VaR Mapping

Learning Objective: Describe the method of mapping forwards, forward rate agreements, interest rate swaps and options.

60. A risk analyst at a hedge fund is evaluating the risk of the fund's portfolio of illiquid assets, whose returns are reported monthly. The analyst is concerned that certain biases resulting from the returns data can make the fund's risk profile appear misleading. In particular, the fund may appear to have low systematic risk when it actually does not. Which of the following represents an appropriate method of correcting this bias?

A. Account for negative serial correlation of returns when extrapolating risk to longer time horizons.

B. Account for positive serial correlation of returns by aggregating the data.

C. Use regressions with fewer lags of the market factors and sum the coefficients across lags.

D. Use regressions with additional lags of the market factors and sum the coefficients across lags.

Correct Answer: D

Explanation: D is correct. Artificially low asset class correlations leading to the appearance of low systematic risk is a bias faced by hedge funds with illiquid holdings that use monthly valuation data. One way to correct this is to use enlarged regressions with additional lags of the market factors and to sum the coefficients across lags.

Section: Risk Management and Investment Management

Reference: Philippe Jorion, Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition (New York: McGraw Hill, 2007). Chapter 17 - VaR and Risk Budgeting in Investment Management

Learning Objective: Describe the risk management challenges associated with investments in hedge funds.

61. A fund of funds (FOF) manager is conducting a performance attribution analysis for a portfolio consisting of equity and fixed-income securities to evaluate the effects of the portfolio manager's asset allocation and security selection decisions. The FOF manager uses the information presented below:

Asset class	Portfolio weight	Benchmark weight	Portfolio return	Benchmark return
Equity	58%	50%	8%	11%
Fixed Income	42%	50%	6%	7%

What is the contribution of the portfolio manager's asset allocation decision to the portfolio's overall excess return?

A. -2.16%

B. -1.84%

C. -0.16%

D. 0.32%

Correct Answer: D

Explanation: D is correct.

The portfolio manager's asset allocation contribution is computed by summing the differences between the portfolio and benchmark weights of each asset class multiplied by the benchmark performance of that asset class.

Contribution from asset allocation:

[(58%-50%)*11%] + [(42%-50%)*7%] = 0.32%

A is incorrect. It is the contribution from security selection:

58%*(8%-11%) + 42%*(6%-7%) = -2.16%

B is incorrect. It is the total excess return:

0.32% - 2.16% = -1.84%

C is incorrect. -0.16% is found by using the below equation for each asset and summing the results:

(Portfolio Weight – Benchmark Weight)*(Portfolio Return – Benchmark Return)

(58%-50%)*(8%-11%)+(42%-50%)*(6%-7%) = -0.16%.

Section: Risk Management and Investment Management

Reference: Describe and apply performance attribution procedures, including the asset allocation decision, sector and security selection decision, and the aggregate contribution.

Learning Objective: Zvi Bodie, Alex Kane, and Alan J. Marcus, Investments, 12th Edition (New York, NY: McGraw-Hill, 2020). Chapter 24. Portfolio Performance Evaluation

62. A pension fund manager is planning to invest a portion of the fund's portfolio into hedge funds. The manager is concerned about the potential asymmetry in risk sharing that may occur with hedge fund investments. What action should the pension fund manager take to mitigate this risk?

A. Allocate the money across several different hedge fund strategies to diversify away the asymmetry in risk sharing.

B. Choose a reputable hedge fund manager that manages investments for other major pension funds.

C. Ensure that the hedge fund managers have a sizable amount of their own wealth invested in their fund.

D. Require the hedge fund to provide a daily position report to better monitor the potential asymmetry in risk sharing.

Correct Answer: C

Explanation: C is correct.

The risk sharing asymmetry is a situation where the hedge fund manager fully enjoys the benefits of upside risk (incentive fees), but only partially suffers from the consequences of downside risk (loss of incentive fees, but does not lose their own capital), whereas the investor fully participates in both upside and downside risk. This asymmetry might cause a hedge fund manager to take excessive risk, especially in cases where the hedge fund is far below its high water mark so managers would need to realize a substantial gain to bring the fund back above that mark in order to begin earning incentive fees again. The most prudent approach to mitigating this risk is to ensure that the hedge fund manager has a sizable portion of their own wealth invested with the hedge fund, so that the hedge fund manager would be more conservative in their risk taking and consider both upside and downside risk.

A is incorrect. Diversifying across many hedge funds or requiring more frequent position reporting may reduce the overall risk of investing in hedge funds but does nothing to address the risk sharing asymmetry. Managers of each fund may still be motivated to take unreasonable risks to earn incentive fees.

B is incorrect. Relying on reputation alone would not solve this risk asymmetry, as is not prudent in any case given examples of hedge fund scandals.

D is incorrect. Hedge funds normally provide very little transparency and their reports are prone to return measurement biases.

Section: Risk Management and Investment Management

Reference: G. Constantinides, M. Harris and R. Stulz, eds., Handbook of the Economics of Finance, Volume 2B (Oxford, UK: Elsevier, 2013). Chapter 17. Hedge Funds

Learning Objective: Describe the problem of risk sharing asymmetry between principals and agents in the hedge fund industry.

63. A risk manager at a bank is seeking to better understand recent liquidity risk failures. Several real-life cases are reviewed. Which of the following lessons would be best illustrated by the case of Metallgesellschaft in 1993?

A. Negative public perception of emergency borrowing from the central bank can cause a bank run.

B. Positive feedback trading in illiquid instruments can cause excessive losses.

C. Hedging liabilities by rolling forward futures contracts may create cash flow mismatches.

D. Futures provide a better effective hedge for hedging commodities exposure than forwards.

Correct Answer: C

Explanation: C is correct. This is a classic case of cash flow mismatch due to margin calls.

A is incorrect. This scenario happened to Northern Rock in 2007.

B is incorrect. This scenario happened to LTCM in 1998.

D is incorrect. Both forwards and futures can be used to hedge commodities exposure, but both can cause liquidity risk when a cash flow mismatch is present.

Section: Liquidity and Treasury Risk

Reference: John C. Hull, Risk Management and Financial Institutions, 5th Edition (Hoboken, NJ: John Wiley & Sons, 2018). Chapter 24 - Liquidity Risk

Learning Objective: Identify liquidity funding risk, funding sources, and lessons learned from real cases: Northern Rock, Ashanti Goldfields and Metallgesellschaft.

64. A risk analyst at an investment bank is conducting performance analyses of hedge funds and real estate funds. The analyst notes the following two issues regarding the funds' annual performance data:

- Whenever a hedge fund stops reporting its performance, it is removed from the database of hedge funds.
- Assets owned by the real estate funds are valued only once a year due to infrequent trading.

Which of the following best describes the impacts of using the data with the aforementioned issues on the results of the performance analyses?

A. The average Sharpe ratio of hedge funds is understated and the average Sharpe ratio of real estate funds is overstated.
B. The average Sharpe ratio of hedge funds is overstated and the average Sharpe ratio of real estate funds is also overstated.
C. The average volatility of hedge funds is overstated and the average volatility of real estate funds is also overstated.
D. The average volatility of hedge funds is overstated and the average volatility of real estate funds is understated.

Correct Answer: B

Explanation: B is correct.

Typically, hedge funds stop reporting because of poor performance. As poor performers drop out of the database, the average performance increases. The removal of poor performers would also reduce average volatility.

Similarly, with infrequent trading, estimates of volatilities, correlations, and betas are too low when computed using reported returns.

Thus, Sharpe ratios would be higher under the circumstances.

Section: Risk Management and Investment Management

Liquidity and Treasury Risk

Reference: G. Constantinides, M. Harris and R. Stulz, eds., Handbook of the Economics of Finance, Volume 2B (Oxford, UK: Elsevier, 2013). Chapter 17 - Hedge Funds

Andrew Ang, Asset Management: A Systematic Approach to Factor Investing (New York: Oxford University Press, 2014). Chapter 13 - Illiquid Assets.

Learning Objective: Explain biases that are commonly found in databases of hedge funds.

Assess the impact of biases on reported returns for illiquid assets.

65. A money manager who has recently received a small amount of new capital is planning to invest this capital into an existing fund, which is benchmarked to an index. Rather than investing in a new asset to be included in the fund, the manager is planning to increase the holding of one of the fund's four assets. Information about these assets, and their performances during the most recent evaluation period, are given below:

Asset	Portfolio weight	Return	Volatility of return	Beta to the portfolio
BDE	0.35	14%	19%	1.20
JKL	0.30	13%	18%	0.90
MNO	0.25	13%	16%	1.00
STU	0.10	10%	10%	0.80

The portfolio manager wants to select the asset that has the lowest marginal VaR as long as its Jensen's alpha is greater than or equal to the market risk premium. Assuming the risk-free interest rate is 3% and the market return is 8%, which asset should the portfolio manager select?

A. Asset BDE

B. Asset JKL

C. Asset MNO

D. Asset STU

Correct Answer: B

Explanation: B is correct. We can derive marginal VaR as:

Marginal VaR of asset i = $(VaR_p/Value_p)*Beta_i$

Since $VaR_p/Value_p$ will be the same for all the assets, the size of beta will actually determine the level of marginal VaRs.

Jensen's Alpha measure is calculated as:

Jensen's Alpha = Actual return – Expected return based on systematic risk

= Actual return – (risk-free rate + (Market return – risk-free rate)*Beta)

Note that the market risk premium = expected market return – risk-free rate = 0.08 - 0.03

= 5%

Thus, among those assets whose Jensen's Alphas are greater than or equal to market risk premiums, Asset JKL has the lowest Marginal VaR:

Asset	Portfolio weight	Actual return	Beta to the portfolio	Marginal VaR	Expected return	Jensen's Alpha
BDE	0.35	14%	1.20	1.2W	9.0%	5.0%
JKL	0.30	13%	0.90	0.9W	7.5%	5.5%
MNO	0.25	13%	1.00	1.0W	8.0%	5.0%
STU	0.10	10%	0.80	0.8W	7.0%	3.0%

where W = $VaR_p/Value_p$.

Section:	Risk Management and Investment Management
Reference:	Philippe Jorion, Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition (New York: McGraw-Hill, 2007). Chapter 7 - Portfolio Risk: Analytical Methods. Zvi Bodie, Alex Kane, and Alan J. Marcus, Investments, 12th Edition (New York: McGraw-Hill, 2020). Chapter 24 - Portfolio Performance Evaluation
Learning Objectives:	Apply the concept of marginal VaR to guide decisions about portfolio VaR. Describe risk-adjusted performance measures, such as Sharpe's measure, Treynor's measure, Jensen's measure (Jensen's alpha), and the information ratio, and identify the circumstances under which the use of each measure is most relevant.

66. A manager of collateralized loan obligations (CLOs) is reviewing the performance of a CLO that has a pool of 50 identical loans, each priced at its par value of GBP 1 million. The underlying loan assets are floating-rate obligations that pay a fixed spread of 150 bps over LIBOR. The coupons and interest payments on the following liabilities are made on an annual basis and occur at the end of the year:

Liabilities	Amount (GBP)	Coupon
Senior debt	37,500,000	LIBOR + 45 bps
Mezzanine debt	10,000,000	LIBOR + 300 bps
Equity	2,500,000	

The manager reports that the CLO initially has no overcollateralization, and the annual excess spread flowing into the overcollateralization account has a limit of GBD 250,000. Suppose the LIBOR curve remains flat at 4% in the first year, and assuming no defaults in the collateral pool and no management and transaction fees, what are the correct amounts that the manager would post to the overcollateralization account and to the equity tranche after the first year?

	Overcollateralization Account	Equity Tranche
A.	GBP 0	GBP 0
B.	GBP 0	GBP 381,250
C.	GBP 250,000	GBP 131,250
D.	GBP 381,250	GBP 0

Correct Answer: C

Explanation: C is correct.

With zero default,

On the asset side (Inflows):
The underlying loans generate cash flows (or interest) of GBP 1,000,000*50*(0.04 + 0.015) = GBP 2,750,000.
On the liabilities side (Outflows):
Senior tranche gets paid by (0.04 + 0.0045)*37,500,000 = GBP 1,668,750.
Mezzanine tranche gets paid by (0.04 + 0.03)*10,000,000 = GBP 700,000.
Excess spread, the amount available for the overcollateralization account and the equity tranche:
= Inflow of GBP 2,750,000 – 1,668,750 – 700,000 = GBP 381,250.
Therefore,
Amount posted to the overcollateralization account
= min(Excess spread, Limit) = min(381,250; 250,000) = GBP 250,000.
Amount posted to the equity tranche = 381,250 – 250,000 = GBP 131,250.

A is incorrect. The overcollateralization account and the equity tranche postings are not GBP 0, as shown in C above.
B is incorrect. The overcollateralization account is not GBP 0, as shown in C above, and the equity tranche is GBP 131,250 as explained in C above.
D is incorrect. The overcollateralization account is not GBP 381,250 because of the annual limit, as explained in C above, and the equity tranche is GBP 131,250 as explained in C above.

Section: Credit Risk Measurement and Management

Reference:	Allan Malz, Financial Risk Management: Models, History, and Institutions (Hoboken, NJ: John Wiley & Sons, 2011). Chapter 9 - Structured Credit Risk
Learning Objective:	Compute and evaluate one or two iterations of interim cash flows in a three-tiered securitization structure.

67. The board of directors of a manufacturing company is reviewing the company's contribution to its defined benefit pension plan. Part of the review focuses on assessing different elements of the plan's funding risk. Which of the following statements about funding risk is correct?

A. Decreases in interest rates always reduce funding risk.

B. Funding risk represents the true long-term risk to the plan sponsor.

C. Funding risk is effectively transferred to the employees of the manufacturing company.

D. As the time horizon for expected payouts gets longer, the plan's funding risk decreases.

Correct Answer: B

Explanation: B is correct. Funding risk of a defined benefit plan is the risk that the value of the pension plan assets will not be sufficient to meet the pension plan liabilities. If the plan has a deficit (that is, if the surplus turns negative), the plan sponsor (the manufacturing company) has to provide additional contributions to the fund. This additional contribution (the funding risk) is borne by the company's shareholders (and not by the employees). Thus, the funding risk represents a true long-term risk to the company (plan sponsor).

A is incorrect. Mismatches between the assets and liabilities create funding risk. In a low interest rate environment, the value of assets (equities on the asset side) will rise; however, the value of liabilities can rise more, thereby exacerbating funding risk. Immunizing the portfolio, essentially matching the duration of assets and liabilities, will reduce funding risk.

C is incorrect. Funding risk is borne by the company's shareholders, not by the employees.

D is incorrect. The time horizon of expected payouts affects asset allocation decisions. A longer horizon doesn't necessarily mean lower funding risk.

Section: Risk Management and Investment Management

Reference: Philippe Jorion, Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition (New York: McGraw Hill, 2007). Chapter 17 - VaR and Risk Budgeting in Investment Management.

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

68. A portfolio manager at an investment firm manages a number of accounts for multiple clients. The manager is analyzing the dispersion that occurs among these accounts, with dispersion defined as the difference between the maximum and minimum return for the accounts. The manager explores the various drivers of dispersion and deliberates over how dispersion can be minimized. Which of the following conclusions is correct for the manager to reach?

A. Dual-benchmark optimization can reduce dispersion and help achieve higher average returns.

B. A portfolio manager's tracking error and dispersion tend to be proportional to each other over time.

C. Dispersion is always client-driven since it refers to the variance in the performances of client portfolios managed by the same manager.

D. Portfolio managers can control dispersion and should aim to reduce any existing dispersion to zero.

Correct Answer: B

Explanation: B is correct. Dispersion is proportional to tracking error, with the constant of proportionality dependent on the number of portfolios managed by the manager.

A is incorrect. Dual-benchmark optimization can help reduce dispersion but at the expense of returns.

C is incorrect. Dispersion can be both client-driven, in which constraints placed by clients lead to differences in portfolio performance, and portfolio manager-driven, in which a lack of attention by the manager results in portfolios having different characteristics such as betas and factor exposures.

D is incorrect. Because of transaction costs, some dispersion is optimal. Managers can control dispersion but should not try to reduce it to zero.

Section: Risk Management and Investment Management

Reference: Richard Grinold and Ronald Kahn, Active Portfolio Management: A Quantitative Approach for Producing Superior Returns and Controlling Risk, 2nd Edition (New York, NY: McGraw-Hill, 2000). Chapter 14. Portfolio Construction

Learning Objective: Describe dispersion, explain its causes, and describe methods for controlling forms of dispersion.

69. An external auditor is reviewing the modeling processes used by a US-based bank to model operational losses as part of the bank's capital planning process. Using guidelines set by the Federal Reserve with respect to capital planning, which of the following processes or assumptions would the auditor find most appropriate?

A. Assuming a high positive correlation between operational loss severity and equity index movements during normal market conditions

B. Using a net charge-off model to predict shorter-term credit losses and a roll-rate model to predict losses over a longer time horizon

C. Modeling operational losses by projecting an annual loss estimate and then evenly distributing the losses across the four quarters of the year

D. Incorporating forward-looking factors and idiosyncratic risk exposures into stressed operational loss estimates

Correct Answer: D

Explanation: D is correct. Banks with stronger practices will incorporate forward-looking and idiosyncratic factors into their stress scenarios.

A is incorrect. Operational risks typically have a low correlation with other market risk variables so assuming a zero correlation is conservative and an acceptable practice (see p. 276). "Most BHCs were not able to find meaningful correlation between macroeconomic variables and operational-risk loss severity". Banks can provide correlation estimates between OpRisk and market risk variables with a proper defense, but assuming that op risk and market risk variables are strongly correlated is a cause for concern.

B is incorrect: This is a weak practice: cf: Fed Capital Planning: "In general, it is a weaker practice to combine two different models, as it can introduce unexpected jumps in estimated losses over the planning horizon". The paper also detailed some difficulties with roll rate models, which estimate the rate at which loans that are current or delinquent in a given quarter roll into delinquent or default status in the next period. By not using the roll-rate model to model the near-term quarters, this could lead to poor predictive power farther out.

C is incorrect. This is a weak practice as it ignores potential seasonal patterns. Rather, a preferred method would be to provide a careful estimate of the expected quarterly path of losses as well as net revenues and capital projections.

Section: Operational Risk and Resiliency

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

Learning Objective: Describe practices that can result in a strong and effective capital adequacy process for a BHC in the following areas:

Estimating losses, revenues, and expenses, including qualitative and qualitative methodologies

70. A bank has implemented a VaR model for its portfolio of commodity derivatives. The bank's risk management unit would like to establish a process for the validation of this new model. Which of the following actions would be most appropriate for a validator to take as part of this process?

A. Validate the model with the help of the model development team to leverage the team's expertise and experience with the model.

B. Review the input parameters and analyze the operational processes and information technology systems that generate the model output.

C. Ensure that traders have access to an independent market and risk data source so that they can determine VaR limits to be used in the model.

D. Ensure that modeling assumptions remain constant over extended periods of time so that model output can be successfully backtested.

Correct Answer: B

Explanation: B is correct. All of these are areas that should be covered by a validation process. As per the text, "the validation process lies not only on statistical comparisons of actual risk measures against the ex-ante estimates, checking of parameter calibrations, benchmarking and stress tests, but also involves analyses of all the components of the internal rating system, including operational processes, controls, documentation, IT infrastructure, as well as an assessment of their overall consistency."

A is incorrect. The validation should be performed independently of those with responsibility for model development.

C is incorrect. The validation team should check and ensure that the middle office, not the trading function, has independent access to an independent market and risk data source. Traders should not be setting their own limits, these should be determined by senior management and perhaps identified in the risk appetite framework.

D is incorrect. Modeling assumptions need to be reviewed regularly to determine if they need to be revised to reflect changes in market conditions

Section: Operational Risk and Resiliency

Reference: Giacomo De Laurentis, Renato Maino, Luca Molteni, Developing, Validating and Using Internal Ratings (Hoboken, NJ: John Wiley & Sons, 2010). Chapter 5. Validating Rating Models

Learning Objective: Explain the process of model validation and describe best practices for the roles of internal organizational units in the validation process.

71. An internal auditor at a large bank is reviewing the bank's economic capital framework to ensure that it meets best practices. The auditor identifies deficiencies in the bank's governance framework as well as the process used to determine the firm-wide economic capital and asks the CRO to suggest corrective actions that conform with best practices. Which of the following actions should the CRO recommend?

A. Require business unit managers to challenge the assumptions for their unit's capital model before providing final approval.

B. Calculate the bank's aggregate economic capital by summing its exposures for different risk types.

C. Incorporate a set of escalation procedures into the bank's contingency plan for its economic capital policy.

D. Discourage the use of macroeconomic scenarios developed by third-party vendors to stress test economic capital models.

Correct Answer: C

Explanation: C is correct. As per the text, "In addition, a capital policy should include governance and escalation protocols that are clear, credible, and actionable in the event an actual or projected capital ratio target is breached."

A is incorrect. The board of directors should have the responsibility for challenging assumptions in capital models and providing final approval for them. Business unit managers should not have the right to provide final approval for the plan for their business unit, as this is decided by the economic capital group and approved by the board.

B is incorrect. This method is overly conservative as it ignores diversification benefits.

D is incorrect. The use of third-party vendor models is not discouraged, but guidelines for banks that use third-party scenarios are provided. Banks are encouraged to tailor these scenarios to their specific risk profiles and unique vulnerabilities, but the guidelines do not say that the use of third-party vendor scenarios be avoided.

Section: Operational Risk and Resiliency

Reference: Range of practices and issues in economic capital frameworks," (Basel Committee on Banking Supervision Publication, March 2009)

Learning Objectives: Within the economic capital implementation framework describe the challenges that appear in:

- Defining and calculating risk measures
- Risk aggregation
- Validation of models
- Dependency modeling in credit risk
- Evaluating counterparty credit risk
- Assessing interest rate risk in the banking book

Describe best practices and assess key concerns for the governance of an economic capital framework.

72. A CFO has asked for a review of the bank's contingency funding plan and would like to ensure that key components are incorporated. Which of the following is a correct statement regarding the key components to be found in an effective contingency funding plan (CFP)?

A. Liquidity stress testing scenarios are designed to focus solely on institution-specific risks and address both market (asset) liquidity and funding liquidity, over short-term and prolonged stress periods.

B. Institutions should align their CFP stress scenarios to those in its liquidity stress testing framework, as well as to other frameworks such as recovery and resolution plans.

C. Identification of contingent actions such as maintaining investment strategies to reinvest maturing securities in order to maximize and maintain bank profitability during stressed periods.

D. The liquidity crisis team may invoke the CFP based on a review of the markets, industry, bank-specific conditions, and liquidity stress testing results.

Correct Answer: B

Explanation: B is correct.

A is incorrect. Liquidity stress testing scenarios should also focus on systemic risks.

C is incorrect. Contingent actions should include rolling off of maturing investments to increase bank liquidity.

D is incorrect. The treasurer in consultation with the CFO may invoke the CFP.

Section: Liquidity and Treasury Management

Reference: Shyam Venkat, Stephen Baird, Liquidity Risk Management (Hoboken, NJ: John Wiley & Sons, 2016). Chapter 7 - Contingency Funding Planning

Learning Objective: Assess the key components of a contingency funding plan (governance and oversight, scenarios and liquidity gap analysis, contingent actions, monitoring and escalation, data and reporting).

73. Two financial institutions are facing different funding issues. Bank A, a mid-size regional bank is concerned that it has a shortfall in legal reserves for the day and is seeking an alternative to address this shortfall. Bank B, a small community bank, on the other hand, has recently experienced a much greater than anticipated shortfall in long term certificates of deposit (CD) renewals due to fierce local competition for retail deposits. Bank B has traditionally used stable CDs to fund its home mortgage portfolio. What is the most appropriate funding response of each of these two institutions considering timing and the availability of non-deposit funds?

A. Bank A should borrow from the wholesale deposit market and Bank B should fund itself through the Eurocurrency deposit market.

B. Bank A should fund itself through the commercial paper (CP) market and Bank B should borrow from the Federal funds market.

C. Bank A should borrow from the Federal funds market and Bank B should borrow from the Federal Home Loan Banks.

D. Bank A should issue debentures and Bank B should fund itself through the CP market.

Correct Answer: C

Explanation: C is correct. Bank A should fund today's shortfall in legal reserves through the Fed Funds Market and Bank B should fund its CD shortfall through borrowing from the Federal Home Loan Banks Advances Program. The bank can match fund its mortgages against the Advance Program funding term.

A is incorrect. Both are deposit funding.

B is incorrect.

D is incorrect.

Section: Liquidity and Treasury Management

Reference: Peter Rose, Sylvia Hudgins, Bank Management & Financial Services, 9th Edition (New York, NY: McGraw- Hill, 2013). Chapter 13 - Managing Non-deposit Liabilities

Learning Objective: Distinguish between the various sources of non-deposit liabilities at a bank.

74. A bank buys a bond on its coupon payment date. Three months later, in order to generate immediate liquidity, the bank decides to repo the bond. Details of the bond and repo transaction are as follows:

Notional (USD)	100,000
Coupon (semi-annual)	5%
Current bond price (USD)	98
Repo haircut	5%
Repo interest rate	3%

If the repo contract expires 6 months from now, what is the bank's expected cash outflow at the end of the repo transaction?

A. USD 94,497

B. USD 95,702

C. USD 97,630

D. USD 100,739

Correct Answer: B

Explanation: B is correct. Cash inflow at beginning of repo: (100,000)*(98%+5%*0.25)*(1-5%) = 94,288; Cash outflow at end of repo: 94,288*(1+3%*0.5)=95,702

A is incorrect. Left out the accrued interest of 5%*0.25 in the correct equation for cash inflow.

C is incorrect. Used 1 instead of 98% for price in the correct equation for cash inflow.

D is incorrect. Left out haircut of 5% in the correct equation for cash inflow.

Section: Liquidity and Treasury Risk

Reference: Bruce Tuckman and Angel Serrat, Fixed Income Securities: Tools for Today's Markets, 3rd Edition (Hoboken, NJ: John Wiley & Sons, 2011). Chapter 12 - Repurchase Agreements and Financing

Learning Objective: Describe the mechanics of repurchase agreements (repos) and calculate the settlement for a repo transaction.

75. A large bank is reviewing its processes and procedures to manage operational risk in accordance with best practices established by the Basel Committee. In implementing the three lines of defense model, which of the following statements is correct?

A. The internal audit function should serve as the first line of defense and continually validate operational procedures used by the business lines.

B. Business line managers, as part of the first line of defense, should provide a credible challenge to the internal audit function.

C. The corporate operational risk function, as part of the second line of defense, should challenge risk inputs from business line managers.

D. The corporate operational risk function should serve as the third line of defense and validate model assumptions made by senior management.

Correct Answer: C

Explanation: C is correct. The Basel three lines of defense model establishes the following lines of defense: In the first line of defense business line managers manage the risk of their business lines, in the second line of defense the corporate operational risk function (CORF) reviews the risk controls put in place by the first line of defense and establishes firm-wide risk management procedures, and in the third line of defense, an independent review (such as an internal auditor) reviews the effectiveness of the risk controls in the first two lines of defense. C is correct, since as part of the second line of defense, the CORF should challenge inputs from business line managers.

A is incorrect, as internal audit is part of the third line of defense and the validation team is generally part of the corporate risk function as part of the second line of defense.

B is incorrect. Business line managers do not challenge the audit function as part of the first line; rather, they manage the risk of the business lines.

D is incorrect, as the CORF is the second line of defense.

Section: Operational Risk and Resiliency

Reference: “Revisions to the Principles for the Sound Management of Operational Risk,” (Basel Committee on Banking Supervision Publication, March 2021)

Learning Objective: Describe the three “lines of defense” in the Basel model for operational risk governance.

76. A CRO at an investment bank has asked the risk department to evaluate the bank's derivative position with a counterparty over a 3-year period. The risk department assumes that the counterparty's default probability follows a constant hazard rate process. The table below presents trade and forecast data on the CDS spread, the expected exposure, and the recovery rate of the counterparty:

	Year 1	Year 2	Year 3
Expected positive exposure (AUD million)	14	14	14
CDS spread (bps)	200	300	400
Recovery rate (%)	80	70	60

Additionally, the CRO has presented the risk team with the following set of assumptions to use in conducting the analysis:

- The investment bank and the counterparty have signed a credit support annex to cover this exposure, which requires collateral posting of AUD 11 million.
- The current risk-free rate of interest is 3% and the term structure of interest rates remains flat over the 3-yearhorizon.
- The collateral and the expected positive exposure values remain stable as projected over the 3-year life of the contract.
- The expected positive exposure and the collateral are assessed by using the same discount factors.
- The probability of default of the bank is 0% per year.

Given the information and the assumptions above, what is the correct estimate of the unilateral CVA for this position?

A. AUD 0.214 million
B. AUD 0.253 million
C. AUD 0.520 million
D. AUD 0.998 million

Correct Answer: A

Explanation: A is correct. To derive the credit valuation adjustment (CVA), we take the PD of the bank to be equal to 0% and use the standard formula:

$CVA = \sum_{t=0}^{n}(1 - RR_t)(EE_t)(PD_t)(DF_t)$,

where (at any time t):

The discount factor (DF_t) is determined from the risk-free rate of 3%. For year 1, 2, and 3, they are exp(-0.03)=0.9704, exp(-0.03*2)=0.9418, and exp(-0.03*3)=0.9139, respectively.

The hazard rate is constant over the 3 years, and λ = spread/(1 – RR) = 10%. Therefore:

Year 1 cumulative probability of default = 1 – exp(-0.1*1) = 9.52% (marginal probability (PD_1))

Year 2 cumulative probability of default = 1 – exp(-0.1*2) = 18.13%; thus, marginal probability (PD_2) = 18.13 – 9.52 = 8.61%.

Year 3 cumulative probability of default = 1 – exp(-0.1*3) = 25.92%; thus, marginal probability (PD_3) = 25.92 – 18.13 = 7.79%.

Collateral amounts of AUD 14 million for each of the years 1, 2 and 3 are considered. Therefore, the rest of the derivation becomes:

	Year 0	Year 1	Year 2	Year 3
Marginal probability of default [PD(t)]		9.52%	8.61%	7.79%
Discount factor (DF)		0.9704	0.9418	0.9139
Recovery rate (RR)		80%	70%	60%
Expected exposure (EE) (AUD million)		14	14	14
Collateral (C) (AUD million)		11	11	11
EE' (netted) (AUD million)		3	3	3
(1-RR)*(EE')*PD(t)*(DF) (AUD million)		0.0554	0.0730	0.0854

$$CVA = \sum_{t=0}^{n}(1 - RR_t)(EE_t)(PD_t)(DF_t) = 0.0554 + 0.0730 + 0.0854 = 0.2138$$

B is incorrect. AUD 0.2527 million is the result obtained when the hazard rate of 10% is used as the marginal default probability for each of the 3 years.

C is incorrect. AUD 0.5201 million is the result obtained when the recovery rate and not the LGD is used.

D is incorrect. AUD 0.9980 million is the result obtained when collateral is not considered.

Section: Credit Risk Measurement and Management

Reference: Jon Gregory, The xVA Challenge: Counterparty Credit Risk, Funding, Collateral, and Capital, 4th Edition (West Sussex, UK: John Wiley & Sons, 2020). Chapter 17 - CVA

Allan Malz, Financial Risk Management: Models, History, and Institutions (Hoboken, NJ: John Wiley & Sons, 2011). Chapter 7 - Spread Risk and Default Intensity Models

Learning Objective: Calculate CVA and CVA as a spread with no wrong-way risk, netting, or collateralization.

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

77. The board of directors at a large bank wants to improve the bank's practices for managing money laundering and financial terrorism (ML/FT) risk. The risk committee of the bank meets to discuss ways to achieve this objective that conform to best practices. Which of the following actions would be most appropriate for the bank to recommend?

A. Require the bank's business units to screen potential employees as part of the first line of defense in managing ML/FT risk.

B. Establish a threshold transaction value and review all transactions above this threshold for evidence of ML/FT.

C. Exclude politically exposed persons (PEPs) from screening for ML/FT risk due to their much lower ML/FT risk.

D. Give the compliance and legal functions the primary responsibility for managing ML/FT risk.

Correct Answer: A

Explanation: A is correct. As part of the first line of defense, business units must identify, assess, and control ML/FT risks, have written policies and procedures as well as employee training for managing ML/FT risk, and screen potential employees.

B is incorrect. Monitoring for ML/FT risk should cover all accounts and transactions.

C is incorrect. Politically exposed persons (PEP) pose higher ML/FT risk given the possibility that some wealth may have been obtained through corruption.

D is incorrect. A chief ML/FT officer should be appointed to lead the bank's management of ML/FT risk, and ideally ML/FT risk should be managed using a three lines of defense approach involving multiple business functions.

Section: Operational Risk and Resiliency

Reference: Mark Carey "Management of Risks Associated with Money Laundering and Financing of Terrorism," GARP Risk Institute, February 2019. [ORR-17]

Learning Objective: Explain best practices recommended for the assessment, management, mitigation and monitoring of money laundering and financial terrorism (ML/FT) risks.

78. A risk analyst evaluates the likelihood of default in a credit portfolio, which consists of two credit assets. The credits are rated BBB and BB with probability of default of 3.5% and 4.2% for next year, respectively. The analyst also reports that the joint default probability of the two credits is 1.0% for the same horizon. What is the implied default correlation for the credit portfolio for next year?

A. 7.7%

B. 8.7%

C. 23.1%

D. 31.1%

Correct Answer: C

Explanation: C is correct. The implied default correlation (ρ_{12}) for the pair of credits is derived by the following formula, where π_1 = 3.5%, π_2 = 4.2%, and π_{12} = 1.0%:

$$\rho_{12} = \frac{\pi_{12} - \pi_1 \pi_2}{\sqrt{\pi_1(1-\pi_1)}\sqrt{\pi_2(1-\pi_2)}}$$

$$\rho_{12} = \frac{1\% - 3.5\% \times 4.2\%}{\sqrt{3.5\% \times (1-3.5\%)} \times \sqrt{4.2\% \times (1-4.2\%)}} = 0.23139 = 23.14\%$$

A is incorrect. It is incorrectly derived as 3.5% + 4.2% = 7.7%.

B is incorrect. It is incorrectly derived as 3.5% + 4.2% + 1% = 8.7%.

D is incorrect. It uses a wrong numerator operation in the formula in C above, (1% + 3.5% x 4.2% instead of 1% – 3.5% x 4.2%).

Section: Credit Risk Measurement and Management

Reference: Allan Malz, Financial Risk Management: Models, History, and Institutions (Hoboken, NJ: John Wiley & Sons, 2011). Chapter 8 - Portfolio Credit Risk (Sections 8.1, 8.2, 8.3 only)

Learning Objective: Define and calculate default correlation for credit portfolios.

79. An investment management firm is in the process of strengthening its internal control environment and forms an independent risk management unit (RMU). An analyst at the firm is asked to prepare a summary document describing the responsibilities of the new unit. While documenting the duties of the RMU, which of the following actions would be appropriate for the analyst to include?

A. Identify appropriate software and research reports to help make trading decisions.

B. Generate VaR levels that are consistent with the targets set in the risk plan.

C. Oversee model analysts while they establish asset valuation models.

D. Assess the quality of models used to measure risk.

Correct Answer: D

Explanation: D is correct. One of the duties of the RMU is to assess the quality of models used to measure portfolio risk, such as through backtesting and validation (p. 102).

A, B, and C are incorrect. They are the duties of investment managers or the portfolio management function.

Section: Risk Management and Investment Management

Reference: Robert Litterman and the Quantitative Resources Group, Modern Investment Management: An Equilibrium Approach (Hoboken, NJ: John Wiley & Sons, 2003). Chapter 17. Risk Monitoring and Performance Measurement

Learning Objective: Describe the objectives and actions of a risk management unit in an investment management firm.

80. A financial institution has a two-way credit support annex (CSA) with a counterparty covering a portfolio valued at JPY 400 million. The margining terms of the collateralized portfolio include a threshold of JPY 180 million, a minimum transfer amount of JPY 30 million, and a margin period of risk of 10 days. Which of the following is correct?

A. A lower threshold value implies that a larger portion of exposure is protected by collateral.

B. A shorter margin period of risk implies that a smaller portion of exposure is protected by collateral.

C. A lower independent amount implies that a larger portion of exposure is protected by collateral.

D. The protection from collateral specified in the CSA is uniform throughout the life of the exposure profile.

Correct Answer: A

Explanation: A is correct. Threshold is the amount of uncollateralized exposure. A lower threshold value means a larger portion of exposure is protected by collateral.

In contrast, C is incorrect because a lower independent amount means a smaller initial margin is posted.

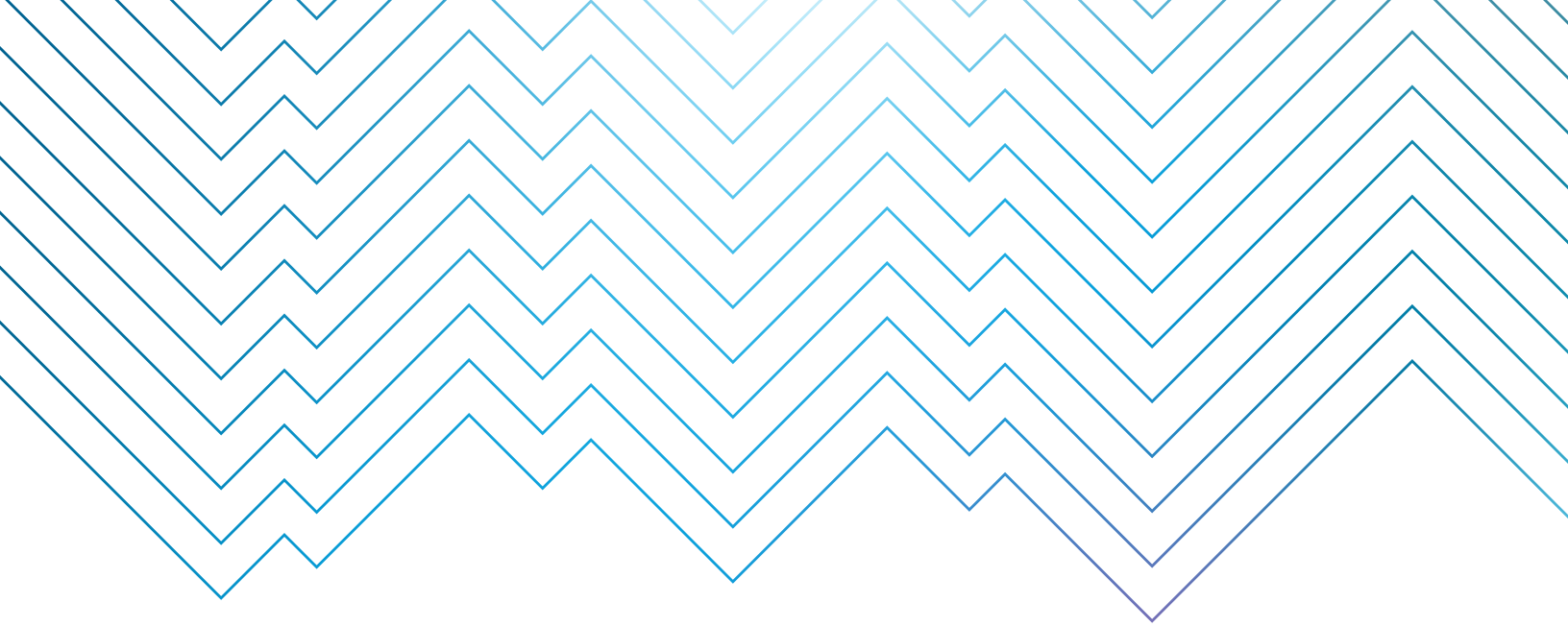
B is incorrect because the margin period of risk is the effective time assumed between a collateral call and receiving the appropriate collateral. Exposure may increase or decrease during this period.

D is incorrect. Collateral has little effect at both the beginning and the end of the exposure profile when the exposure is relatively small.

Section: Credit Risk Measurement and Management

Reference: Jon Gregory, The xVA Challenge: Counterparty Credit Risk, Funding, Collateral, and Capital, 4th Edition (West Sussex, UK: John Wiley & Sons, 2020). Chapter 6 – Margin (Collateral) and Settlement

Learning Objective: Describe the terms of a collateral agreement and features of a credit support annex (CSA) within the ISDA Master Agreement including threshold, initial margin, minimum transfer amount and rounding, haircuts, credit quality, and credit support amount.



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