CFA LEVEL II FIXED INCOME REVIEW
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PRACTICE PROBLEMS

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Use the following spot rate curve to answer this question:

Maturity	1	2	3
Spot rates	5%	5.5%	6%

The 1-year forward rate in one year [$f(1,1)$] and the 1-year forward rate in two years [$f(2,1)$] is *closest* to:

$f(1,1)$	$f(2,1)$

○ **A)** 6%   7%

○ **B)** 5.25%   5.75%

○ **C)** 4%   4.89%

The following are some of the current par rates:

Year	Par rate
1	5.00%
2	6.00%
3	7.00%

Using bootstrapping, the 3-year spot rate is closest to:

○ **A)** 6.67%

○ **B)** 6.93%

○ **C)** 7.09%

If the 2-year spot rate is 4% and 1-year spot rate is 7%, the one year forward rate one year from now is *closest* to:

○ **A)** 3%

○ **B)** 1%

○ **C)** 2%

Practice Problem 4

Use the following spot rate curve to answer this question:

Maturity	1	2	3
Spot rates	5%	5.5%	6%

The price of a 1-year $1 par, zero-coupon bond to be issued in two years is *closest* to:

○ **A)** $0.8396

○ **B)** $0.9345

○ **C)** $0.9434

Don McGuire, fixed income specialist at MCB bank makes the following statement: "In the very short-term, the expected rate of return from investing in any bond, including risky bonds, is the risk-free rate of return".

McGuire's statement is *most* consistent with:

○ **A)** local expectations theory.

○ **B)** unbiased expectations theory.

○ **C)** liquidity preference theory.

Practice Problem 1

Jorgen Welsher, CFA obtains the following quotes for zero coupon government bonds all with a par value of $100.

Type of Price	Delivery (years)	Maturity (years)	Price
Spot	0	3	$91.51
Forward	2	3	$94.55
Spot	0	2	$92.45

Welsher can earn arbitrage profits by:

○ **A)** buying the 2-year bond in the spot market, going long the forward contract and selling the 3-year bond in the spot market.

○ **B)** buying the 2-year bond in the spot market, going short the forward contract and selling the 3-year bond in the spot market.

○ **C)** selling the 2-year bond in the spot market, going short the forward contract and buying the 3-year bond in the spot market.

Sam Roit, CFA, has collected the following information on the par rate curve, spot rates, and forward rates to generate a binomial interest rate tree consistent with this data.

Maturity	Par Rate	Spot Rate
1	5%	5.000%
2	6%	6.030%
3	7%	7.097%

The binomial tree generated is shown below (one year forward rates) assuming a volatility level of 10%:

0	1	2
5%	7.7099%	C
	A	9.2625%
		B

Riot also generated another tree using the same spot rates but this time assuming a volatility level of 20% as shown below:

0	1	2
5%	8.9480%	13.8180%
	5.9980%	9.2625%
		6.2088%

Is the binomial tree using the 20% volatility assumption calibrated properly?

○ **A)** The tree is calibrated properly.

○ **B)** The tree is not calibrated properly because adjacent nodes are not appropriate standard deviations apart.

○ **C)** The tree is not calibrated properly because it is not consistent with market prices.

Which of the following is equal to the value of the putable bond? The putable bond value is equal to the:

○ **A)** option-free bond value plus the value of the put option.

○ **B)** callable bond plus the value of the put option.

○ **C)** option-free bond value minus the value of the put option.

Bill Moxley, CFA is evaluating three bonds for inclusion in fixed income portfolio for one of his pension fund clients. All three bonds have a coupon rate of 3%, maturity of five years and are generally identical in every respect except that bond A is an option-free bond, bond B is callable in two years and bond C is putable in two years. The yield curve is currently flat.

If the yield curve is expected to have a parallel downward shift, the bond with the highest price appreciation is *least likely* to be:

○ **A)** Bond B

○ **B)** Bond A

○ **C)** Bond C

Using the following tree of semiannual interest rates what is the value of a putable bond that has one year remaining to maturity, a put price of 99, coupons paid semiannually with payments based on a 5% annual rate of interest?

      7.59%

6.35%

      5.33%

○ **A)** 99.00.

○ **B)** 98.75.

○ **C)** 97.92.

Relative to the binomial model, Monte Carlo method is *most likely*:

○ **A)** more suitable when valuing securities whose cash flows are interest rate path dependent.

○ **B)** more flexible as it does not need a volatility estimate.

○ **C)** less flexible in forcing interest rates to mean revert.

For a convertible bond, which of the following is *least* accurate?

○ **A)** A convertible bond may be putable.

○ **B)** The conversion ratio times the price per share of common stock is a lower limit on the bond's price.

○ **C)** The issuer can decide when to convert the bonds to stock.

Lena Liecken is a senior bond analyst at Taurus Investment Management. Kristel Kreming, a junior analyst, works for Liecken in helping conduct fixed-income research for the firm's portfolio managers. Liecken and Kreming meet to discuss several bond positions held in the firm's portfolios.

Bonds I and II both have a maturity of one year, an annual coupon rate of 5%, and a market price equal to par value. The risk-free rate is 3%. Historical default experiences of bonds comparable to Bonds I and II are presented below:

Bond	Recovery Rate	Percentage of Bonds That Survive and Make Full Payment
I	40%	98%
II	35%	99%

Bond III is a zero-coupon bond with three years to maturity. Liecken evaluates similar bonds and estimates a recovery rate of 38% and a risk-neutral default probability of 2%, assuming conditional probabilities of default. Kreming creates Exhibit 2 to compute Bond III's credit valuation adjustment. She assumes a flat yield curve at 3%, with exposure, recovery, and loss given default values expressed per 100 of par value.

Date	Exposure	Recovery	Loss Given Default	Probability of Default	Probability of Survival	Expected Loss	Present Value of Expected Loss
0							
1	94.2596	35.8186	58.4410	2.0000%	98.0000%	1.1688	1.1348
2	97.0874	36.8932	60.1942	1.9600%	96.0400%	1.1798	1.1121
3	100.0000	38.0000	62.0000	1.9208%	94.1192%	1.1909	1.0898
Sum				5.8808%		3.5395	3.3367

Bond IV is an AA rated bond that matures in five years, has a coupon rate of 6%, and a modified duration of 4.2. Liecken is concerned about whether this bond will be downgraded to an A rating, but she does not expect the bond to default during the next year. Kreming constructs a partial transition matrix, which is presented in Exhibit 3, and suggests using a model to predict the rating change of Bond IV using leverage ratios, return on assets, and macroeconomic variables.

Partial One-Year Corporate Transition Matrix (entries in %)

From/To	AAA	AA	A
AAA	92.00	6.00	1.00
AA	2.00	89.00	8.00
A	0.05	1.00	85.00
Credit Spread (%)	0.50	1.00	1.75

Kreming calculates the risk-neutral probabilities, compares them with the actual default probabilities of bonds evaluated over the past 10 years, and observes that the actual and risk-neutral probabilities differ. She makes two observations regarding the comparison of these probabilities:

Observation 1:   Actual default probabilities include the default risk premium associated with the uncertainty in the timing of the possible default loss.

Observation 2:   The observed spread over the yield on a risk-free bond in practice includes liquidity and tax considerations, in addition to credit risk.

1. The expected exposure to default loss for Bond I is:

    A. less than the expected exposure for Bond II.

    B. the same as the expected exposure for Bond II.

    C. greater than the expected exposure for Bond II.

2. Based on Exhibit 1, the loss given default for Bond II is:

   A. less than that for Bond I.

   B. the same as that for Bond I.

   C. greater than that for Bond I.

3. Based on Exhibit 1, the expected future value of Bond I at maturity is closest to:

   A. 98.80.

   B. 103.74.

   C. 105.00.

4. Based on Exhibit 1, the risk-neutral default probability for Bond I is closest to:

   A. 2.000%.

   B. 3.175%.

   C. 4.762%.

5. Based on Exhibit 2, the credit valuation adjustment for Bond III is closest to:

   A. 3.3367.

   B. 3.5395.

   C. 5.8808.

6. Based on Exhibit 3, if Bond IV's credit rating changes during the next year to an A rating, its expected price change would be closest to:

   A. –8.00%.

   B. –7.35%.

   C. –3.15%.

7. Kreming's suggested model for Bond IV is a:

   A. structural model.

   B. reduced-form model.

   C. term structure model.

8. Which of Kreming's observations regarding actual and risk-neutral default probabilities is correct?

   A. Only Observation 1

   B. Only Observation 2

   C. Both Observation 1 and Observation 2

Which of the following statements regarding credit ratings is *least* accurate?

○ **A)** A disadvantage of traditional credit ratings is that they are stable over time which reduces the correlation with a debt offering's default probability.

○ **B)** An advantage of traditional credit ratings is that they provide a simple way of summarizing complex credit analysis.

○ **C)** An advantage of traditional credit ratings is that they tend to vary with the business cycle which accurately reflects current risk.

Which of the following two securities are *most likely* used to calculate the term structure of credit spreads?

○ **A)** A corporate issuer's senior debt and the same issuer's subordinated debt.

○ **B)** A corporate issuer's coupon paying bond and the same issuer's zero coupon bond.

○ **C)** A corporate issuer's zero coupon bond and a default free zero coupon bond.

An investor currently holds a zero coupon bond that matures in two years and has a face value of $100,000. The continuously compounded risk free rate is 0.60% an the bond issuer's credit spread is 0.25%. The present value of the expected loss implied by the credit spread is *closest* to:

- A) $1,679.
- B) $246.
- C) $493.

John Smith, a fixed-income portfolio manager at a €10 billion sovereign wealth fund (the Fund), meets with Sofia Chan, a derivatives strategist with Shire Gate Securities (SGS), to discuss investment opportunities for the Fund. Chan notes that SGS adheres to ISDA (International Swaps and Derivatives Association) protocols for credit default swap (CDS) transactions and that any contract must conform to ISDA specifications. Before the Fund can engage in trading CDS products with SGS, the Fund must satisfy compliance requirements.

Smith explains to Chan that fixed-income derivatives strategies are being contemplated for both hedging and trading purposes. Given the size and diversified nature of the Fund, Smith asks Chan to recommend a type of CDS that would allow the Fund to simultaneously fully hedge multiple fixed-income exposures.

Smith and Chan discuss opportunities to add trading profits to the Fund. Smith asks Chan to determine the probability of default associated with a five-year investment-grade bond issued by Orion Industrial. Selected data on the Orion Industrial bond are in Exhibit 1 below.

Year	Hazard Rate
1	0.22%
2	0.35%
3	0.50%
4	0.65%
5	0.80%

Chan explains that a single-name CDS can also be used to add profit to the Fund over time. Chan describes a hypothetical trade in which the Fund sells £6 million of five-year CDS protection on Orion, where the CDS contract has a duration of 3.9 years. Chan assumes that the Fund closes the position six months later, after Orion's credit spread narrowed from 150 bps to 100 bps.

Chan discusses the mechanics of a long/short trade. In order to structure a number of potential trades, Chan and Smith exchange their respective views on individual companies and global economies. Chan and Smith agree on the following outlooks.

Outlook 1: The European economy will weaken.
Outlook 2: The US economy will strengthen relative to that of Canada.
Outlook 3: The credit quality of electric car manufacturers will improve relative to that of traditional car manufacturers.

Chan believes US macroeconomic data are improving and that the general economy will strengthen in the short term. Chan suggests that a curve trade could be used by the Fund to capitalize on her short-term view of a steepening of the US credit curve.

Another short-term trading opportunity that Smith and Chan discuss involves the merger and acquisition market. SGS believes that Delta Corporation may make an unsolicited bid at a premium to the market price for all of the publicly traded shares of Zega, Inc. Zega's market capitalization and capital structure are comparable to Delta's; both firms are highly levered. It is anticipated that Delta will issue new equity along with 5- and 10-year senior unsecured debt to fund the acquisition, which will significantly increase its debt ratio.

1. To satisfy the compliance requirements referenced by Chan, the Fund is most likely required to:

    A. set a notional amount.

    B. post an upfront payment.

    C. sign an ISDA master agreement.

2. Which type of CDS should Chan recommend to Smith?

    A. CDS index

    B. Tranche CDS

    C. Single-name CDS

3. Based on Exhibit 1, the probability of Orion defaulting on the bond during the first three years is closest to:

A. 1.07%.

B. 2.50%.

C. 3.85%.

4. To close the position on the hypothetical Orion trade, the Fund:

A. sells protection at a higher premium than it paid at the start of the trade.

B. buys protection at a lower premium than it received at the start of the trade.

C. buys protection at a higher premium than it received at the start of the trade.

5. The hypothetical Orion trade generated an approximate:

    A. loss of £117,000.

    B. gain of £117,000.

    C. gain of £234,000.

6. Based on the three economic outlook statements, a profitable long/short trade would be to:

A. sell protection using a Canadian CDX IG and buy protection using a US CDX IG.

B. buy protection using an iTraxx Crossover and sell protection using an iTraxx Main.

C. buy protection using an electric car CDS and sell protection using a traditional car CDS.

7. The curve trade that would best capitalize on Chan's view of the US credit curve is to:

A. buy protection using a 20-year CDX and buy protection using a 2-year CDX.

B. buy protection using a 20-year CDX and sell protection using a 2-year CDX.

C. sell protection using a 20-year CDX and buy protection using a 2-year CDX.

8. A profitable equity-versus-credit trade involving Delta and Zega is to:

   A. short Zega shares and buy protection on Delta using the 10-year CDS.

   B. go long Zega shares and buy protection on Delta using 5-year CDS.

   C. go long Delta shares and buy protection on Delta using 5-year CDS.