

## **Credit Scoring & Structural & Reduced Form Models: Sample Exam Questions**

1. In the Merton model, debt holders' position is as if they
  - A. Hold risk free debt and are long a put option on the firm's assets
  - B. Hold risk free debt and are short a put option on the firm's assets
  - C. Are long a call option on the firm's assets
  - D. Are short a call option on the firm's assets
  
2. In structural models of default, equity holders are:
  - A. Long a call option on the firm's assets
  - B. Short a call option on the firm's assets
  - C. Long a put option on the firm's assets
  - D. Short a put option on the firm's assets
  
3. In structural models of default, if the volatility of the firm increases, holding all else constant,
  - A. Both the equity holders and the debt holders are better off
  - B. Both the equity holders and the debt holders are worse off
  - C. The equity holders are better off, but the debt holders are worse off
  - D. The equity holders are worse off, but the debt holders are better off
  
4. In structural models of default, if the value of the firm increases, holding all else constant,
  - A. Both the equity holders and the debt holders are better off
  - B. Both the equity holders and the debt holders are worse off
  - C. The equity holders are better off, but the debt holders are worse off
  - D. The equity holders are worse off, but the debt holders are better off
  
5. The probability of default predicted by the Merton model is:
  - A. An accurate estimation of the real-world probability of default.
  - B. Generally higher than the real-world probability of default, as Merton took a conservative approach while devising the model.
  - C. Generally lower than the real-world probability of default, as the Merton model uses the normality assumption that ascribes unrealistically low probabilities to left tail realizations.
  - D. Accurate for industrial firms but generally inaccurate for Hi-Tech firms, as Merton devised the model before the Hi-Tech revolution.

6. A zero coupon bond with a maturity of one-year pays \$1,000 if the issuing firm is not in default. If the firm is in default, the recovery rate is 35%. The risk-free interest rate for one year is 5% and the risk-neutral probability that the firm defaults is 20%. What is today's price for this bond using the reduced-form approach?

- A. \$781.28
- B. \$828.57
- C. \$885.71
- D. \$912.92

7. A zero coupon bond with a maturity of one-year pays \$1,000 if the issuing firm is not in default. If the firm is in default, the recovery rate is 35%. The risk-free interest rate for one year is 5% and the risk-neutral probability that the firm defaults is 20%. What is the credit spread (over the risk-free rate) on the bond using the reduced-form approach?

- A. 7.90%
- B. 12.90%
- C. 15.69%
- D. 20.69%

8. Suppose we have a zero coupon bond that pays \$1 after one year if the issuing firm is not in default. If the firm is in default, the recovery rate is 42%. The risk free interest rate for one year is 5%. If the credit spread on the bond is 2.5%, what is the risk-neutral probability of default of the bond using the reduced-form approach?

- A. 0.01
- B. 0.02
- C. 0.03
- D. 0.04

9. During economic recessions, default rates tend to \_\_\_\_\_, and the average Loss Given Default (LGD) tends to \_\_\_\_\_

- A. Fall; rise
- B. Fall; fall
- C. Rise; rise
- D. Rise; fall

10. Using the Altman Z Score model to predict the one-year default probability of a publicly traded firm requires:

- A. Information contained in the most recent financial statements of the firm
- B. The current equity market value of the firm
- C. Information contained in the most recent financial statements of the firm and the current equity market value of the firm
- D. Information contained in the most recent financial statements of the firm, the current equity market value of the firm, and the equity volatility of the firm

11. Consider a publicly traded firm whose only debt is zero-coupon debt with a face value of 7 billion USD and a maturity of one year. Using the Merton model to predict the one-year default probability of that firm requires:

- A. Information contained in the most recent financial statements of the firm, the current equity market value of the firm, and the equity volatility of the firm
- B. The current equity market value of the firm, and the equity volatility of the firm
- C. The current equity market value of the firm, the current price of the bond issued by the firm with a maturity of one-year, and the equity volatility of the firm
- D. The current equity market value of the firm, and the current price of a bond issued by the firm with a maturity of one-year

12. Firm ABC has a one-year risk-neutral default probability of 0.03 and a recovery rate of 70%. Consider a CDS contract on this firm, where premiums are paid at the end of the year. If default occurs, it is assumed to happen at the end of the year. Using the reduced form approach, the CDS spread of ABC is

- A. 30 bps
- B. 70 bps
- C. 90 bps
- D. 210 bps

13. Suppose the default probability of a firm, conditional on it not having defaulted so far, is 0.06 per year. What is the 10-year survival probability of the firm?

- A. 0.40
- B. 0.46
- C. 0.54
- D. 0.60

14. Suppose the default probability of a firm, conditional on it not having defaulted so far, is 0.07 per year. What is the 4-year default probability of the firm?

- A. 0.25
- B. 0.28
- C. 0.72
- D. 0.75

## Credit Default Models: Sample Exam Question Answers

1. In structural models of default, zero-coupon risky debt value in a firm is equal to risk free debt minus a put option on the firm's assets. **Answer = B.**
2. In structural models of default, equity holders in a leveraged firm have a long call option on the firm's assets. **Answer = A.**
3. The value of both a call option and a put option increase with the volatility of the underlying. In a structural model, the underlying is the firm's assets. The equity holders are long a call option on the firm and so they are better off, while the bond holders short a put option, and so they are worse off as the volatility increases. **Answer = C.**
4. As the value of the underlying increases, the call option value increases, while the put option value decreases. The equity holders have a long position in the call, so they are better off, while the bond holders have a short position in the put, so they are better off as well. This result is intuitive. **Answer = A.**
5. Generally lower than the real-world probability of default, as the Merton model uses the normality assumption that ascribes unrealistically low probabilities to left tail realizations. **Answer = C.**

6. We use the following:

$$\text{Price} = B^* = \frac{0.2(350) + 0.8(1,000)}{1 + 0.05} = \$828.57$$

**Answer = B.**

7. The yield on the risky bond is  $(1000/828.57 - 1) = 20.69\%$ . The risk free rate is 5%, and so the spread is  $20.69 - 5 = 15.69$ .

**Answer = C.**

8. The yield on the risky bond is  $2.5 + 5 = 7.5\%$ , so the bond price is:

$$B^* = \frac{1,000}{1 + 0.075} = \frac{p(420) + (1 - p)(1,000)}{1 + 0.05}$$

Solving the above for p yields  $p=0.04$ . **Answer = D.**

9. See lecture notes. **Answer = C.**
10. The Altman Z-Score model is based on variables in financial statements and on equity price. **Answer = C.**
11. Given the face-value of the one-year zero, the Merton model requires the current equity market value of the firm, and the equity volatility of the firm. **Answer = B.**
12. In the reduced form model, for a one year CDS, the spread is  $S = (1 - \delta) \times P$ , where  $\delta$  is the recovery rate and  $P$  is the default rate.  $S = 0.3 \times 0.03 = 0.009 = 90$  bps. **Answer = C.**
13. The one-year survival probability is 0.94, so the ten-year survival probability is  $0.94^{10} = 0.54$ . **Answer = C.**
14. The one-year survival probability is 0.93, so the 4-year survival probability is  $0.93^4 = 0.75$ . Note that:  
Default Probability =  $1 - \text{survival probability} = 0.25$ . **Answer = A.**