

Set 1 Questions

1. Which of the following statements is *most accurate*? The four measures commonly used to quantify credit risk are:
 - A. credit spread, risk premium, present value of expected loss and recovery rate.
 - B. probability of default, loss given default, expected loss, and the present value of expected loss.
 - C. recovery rate, loss given default, expected loss and credit spread.

Table 1: Information on three bond issues

Company	Probability of Default (% per year)	Expected Loss (dollars per 100 par)	Present Value of the Expected Loss (dollars per 100 par)
Ace Corp.	1.25	\$25.00	\$21.70
Paxton, plc.	0.75	\$26.50	\$22.00
Bosse Inc.	2.35	\$40.00	\$35.00

2. Based on the information in Table 1, all else constant which company is *most* risky in terms of probability of default and which company is *least* risky in terms of expected loss?
 - A. Paxton, Bosse.
 - B. Bosse, Ace.
 - C. Bosse, Bosse.
3. The difference in ranking between probability of default and expected loss is due to:
 - A. discounting.
 - B. loss given default.
 - C. time value of money.
4. Based on Table 1, which company is the *least* risky according to the *most preferred* measure?
 - A. Ace.
 - B. Paxton.
 - C. Bosse.
5. Based on credit scoring, if Borrower X has a credit score of 600, and Borrower Y has a credit score of 300, then:
 - A. Borrower X is half as likely to default as Borrower Y.
 - B. as economy deteriorates, Borrower X score changes to reflect the economic state even if his financial circumstances remain unaffected.
 - C. Borrower X is less likely to default than Borrower Y
6. Credit scores and credit ratings both provide a(n):
 - A. cardinal ranking of a borrower's credit risk.
 - B. ordinal ranking of a borrower's credit risk.
 - C. an estimate of the borrower's default probability.
7. Regarding credit ratings, which of the following statements is *least accurate*?
 - A. Credit ratings tend to be stable over time which reduces volatility in debt market prices.

- B. Credit ratings do not depend on the business cycle.
 - C. An issuer-pays model does not create an incentive conflict.
8. Which of the following is *most likely* a characteristic of the structural model?
- A. In a structural model, holding the company's stock is comparable to owning a European call option on the company's assets
 - B. The structural model implies that the probability of default is equal to the probability that the equity's value is less than the face value of the debt.
 - C. In a structural model, owning a company's debt is similar to owning a risk-free zero-coupon bond and simultaneously buying a European put option on the company's assets with the same exercise price as the bond's face value.

Table 2: Select information on Company Z

Asset value at time t , A_t	\$1,000.
Expected return on assets: u	0.04 per year.
Risk-free rate: r	0.02 per year.
Face value of debt: K	\$750.
Time to maturity of debt: $T-t$	1 year.
Asset return volatility: σ	0.25 per year
Company Z information for credit risk measures:	
$N(-d1)$	0.0876
$N(-d2)$	0.1344
$N(-e1)$	0.0755
$N(-e2)$	0.1179
Expected loss	\$9.84
Present value of expected loss	\$11.20

9. Based on the information in Table 2, using the structural model for credit risk measures, the probability of default is closest to:
- A. 11%.
 - B. 12%.
 - C. 10%.
10. Based on the information in Table 2, the value an investor would pay to an insurer to remove the default risk from holding Company Z bond is *closest to*:
- A. \$11.
 - B. \$12.
 - C. \$13.
11. In reduced form models, the expression for debt price consists of:
- A. present value of the recovery rate and loss given default.
 - B. debt's expected discounted payoff of face value given no default and debt's expected discounted payoff if default occurs.
 - C. functional forms of default intensity and loss given default.

12. Consider the following information of a debt issue of Company P:

Face value, K	\$700
Time to maturity	1 year
Default intensity, λ	0.015
Loss given default, γ	30%
Price of 1-year default-free zero-coupon bond	0.95
Following Credit Measures are calculated using the reduced form model	
Probability of default	0.0149
Expected loss	\$3.143
Present value of the expected loss	\$2.986

The premium for the risk of credit loss:

- A. is dominated by the discount for the time value of money.
- B. dominates the discount for the time value of money.
- C. is equal to the time value of money discount rate.

13. A credit analyst is calculating the one-year default probability of Company X by using a new logistic regression model. The table below shows the outputs from running a logistic regression using only four explanatory variables. The coefficients of the model and the inputs for Company X are given as follows:

Coefficient Name	Coefficient Value	Input Value	Input Name
Alpha	-3		Constant term
b1	0.7	0.063	Unemployment (decimal)
b2	1.2	0.82	Market leverage ratio (decimal)
b3	-3	0.015	Net income/Assets (decimal)
b4	-1	0.055	Cash/Assets (decimal)

Using the logistic function equation and substituting the specific input values (for monthly observation periods), the monthly default probability for Company X is closest to:

- A. 16%.
- B. 13%.
- C. 11%.

14. Which of the following is *not* an assumption of the structural model?

- A. Company's assets trade in frictionless arbitrage free markets.
- B. The risk free rate of interest is constant over time.
- C. The company's assets have a normal distribution with mean μ and variance σ^2 .

15. Which of the following is *least likely* a strength of the structural model?

- A. It gives an option analogy for understanding a company's default probability.
- B. Current market prices can be used to estimate its value.
- C. Credit risk measures can be estimated only by using implicit estimation.

16. Which of the following assumptions is made by structural models but not by reduced form models?

- A. A company's assets trade in frictionless arbitrage free markets.
- B. A company's zero-coupon bond trades in frictionless arbitrage free markets.

- C. A company's default probability depends on the state of the economy.
17. Which of the following is *least likely* a strength of the reduced form model?
- The model uses the hazard rate estimation methodology.
 - The model does not require a specification of the company's balance sheet structure.
 - The model's credit risk measures depend upon the state of the business cycle.
18. The credit spread is equal to:
- difference between the default-free zero-coupon prices and risky coupon prices.
 - the expected percentage loss per year on the risky zero-coupon bond.
 - difference between the yield to maturity of a government coupon bond and the yield to maturity of a non-investment grade bond.
19. France-based, PVX Company promises to pay €30 on 30 April 2018. Today is 30 April 2016. The risk-free zero-coupon yield on French bonds is 0.45%. PVX credit spread for payment due 30 April 2018 is 0.25%. All yields and spreads are continuously compounded.
- | PMT Date | Risk-Free Zero-Coupon Yields (%) | Credit Spread (%) | Total Yield (%) | Years to Maturity | Discount Factor | Cash Flow (€) | Present Value (€) | Risk-Free Discount Factor | Risk-Free Present Value (€) |
|-----------|----------------------------------|-------------------|-----------------|-------------------|-----------------|---------------|-------------------|---------------------------|-----------------------------|
| 4/30/2018 | 0.45 | 0.25 | 0.70 | 2 | 0.9861 | 30 | 29.5830 | 0.9911 | 29.7330 |
- Based on the table above, the present value of the expected loss in euros due to credit risk is *closest to*?
- 0.12
 - 0.14
 - 0.15
20. When an interest payment is missed, an asset-backed security:
- goes into default.
 - defaults and causes the SPE to default as well.
 - does not go into default.
21. The credit risk measures for asset-backed securities are similar to those used for corporate bonds *except* that:
- probability of default is not applicable.
 - expected loss is not determined.
 - present value of expected loss is not applicable.

Set 1 Solutions

1. B is correct. The credit risk measures for fixed-income securities are: the probability of default, the loss given default, the expected loss, and the present value of the expected loss. Section 2. LO.a.
2. B is correct. Bosse has the highest probability of default and Ace has the lowest expected loss. Section 2. LO.a.
3. B is correct. The difference between probability of default and expected loss is due to the loss given default. Expected loss is equal to the probability of default multiplied by the loss given default. A & C are incorrect because these are modifications required to calculate the present value of expected loss. Section 2. LO.a.
4. A is correct. The present value of the expected loss is the preferred measure because it includes the probability of default, the loss given default, the time value of money, and the risk premium in its computation. According to the present value of expected loss, Ace is least risky. Section 2. LO.a.
5. C is correct. Credit scores provide an ordinal ranking of a borrower's credit risk. The higher the score, the less risky the borrower. If Borrower X has a higher credit score than Borrower Y then the interpretation is X is less likely to default than Y, but it does not mean that Borrower X is half as likely to default as Borrower Y, hence A is incorrect. C is incorrect because credit scores do not depend on current economic conditions. Section 3. LO.b.
6. B is correct. Credit scores and credit ranking both give an ordinal ranking, because both approaches rank borrowers' riskiness. They do not provide an estimate of a borrower's or loan's default probability. Probabilities of default provide a cardinal ranking of credit. Section 3. LO.b.
7. C is correct. The issuer-pays model for compensating credit-rating agencies has a potential conflict of interest that may distort the accuracy of credit ratings. Credit rating agencies are paid by the issuer and consequently have an incentive to give a higher rating than may be justified. A & B are correct statements regarding credit ratings. Section 3. LO.c.
8. A is correct. In a structural model the equity holders will pay off the debt at maturity only if the value of the assets exceed debt at maturity T. If A_T is the value of assets and K is the face value of debt, then payment is only in case of $A_T \geq K$. After the payment, they keep what's left over ($A_T - K$). If $A_T < K$, the equity holders will default on the debt issue. Consequently, the time T value of the equity is $S_T = \max[A_T - K, 0]$. The company's equity has the same payoff as a European call option on the company's assets with strike price K and maturity T. Hence, holding the company's equity is economically equivalent to owning a European call option on the company's assets. B is incorrect because the probability that the debt defaults is equal to the probability that the *asset's value* falls below the face value of the debt. C is incorrect because "owning debt" is similar to owning a riskless zero-coupon bond and

simultaneously selling a European put option on company's assets with the same exercise price as bond's face value. Section 4.1. LO.d.

9. B is correct. $N(-e_2) = 0.1179 = 11.79\%$. Section 4.3. LO.d.
10. A is correct. The present value of expected loss is: $KP(t, T) - D(t, T) = Ke^{-r(T-t)}N(-d_2) - A_tN(-d_1) = 750e^{-0.02(1)}(0.1344) - 1000(0.0876) = \11.2040 .
This value is how much an investor would pay to a third party (an insurer) to remove the risk of default from holding \$750 bond. Section 4.3. LO.d.
11. B is correct. Expression for debt consists of two parts. The first term represents the debt's expected discounted payoff K given that there is no default on the company's debt. The discount rate $[r_u + \lambda(X_u)]$ has been increased for the risk of default. The second term on the represents the debt's expected discounted payoff if default occurs. Section 5.1. LO.e.
12. A is correct. The present value of expected loss is less than the expected loss. Hence the time value of money dominates the risk premium. Section 5.2. LO.e.
13. C is correct. Using the logistic function:

$$prob(t) = \frac{1}{1 + e^{3 - 0.7(0.063) - 1.2(0.82) + 3(0.015) + 1(0.055)}} = 0.1119 = 11.19\%$$
 Section 5.3.2. LO.e.
14. C is correct. The correct assumption of the structural model is that the time T value of the company's assets has a lognormal distribution with mean uT and variance σ^2T . A & B are assumptions of the model. Section 4.2. LO.f.
15. C is correct. For the structural model, one cannot use historical estimation. The reason is that the company's assets (which include buildings and non-traded investments) do not trade in frictionless markets. Consequently, the company's asset value is not observable. Because one cannot observe the company's asset value, one cannot use standard statistics to compute a mean return or the asset return's standard deviation. This leaves implicit estimation as the only alternative for the structural model. Credit risk measures are biased because implicit estimation procedures inherit errors in the model's formulation. A & B are structural model strengths. Section 4.4. LO.f.
16. A is correct. Reduced form models replace the structural model assumption that the company's assets trade with a more practical one — that some of the company's debt trades. A represents an assumption made by structural models, but not by reduced form models. B represents an assumption made by reduced form models. C is not correct because in structural models, credit risk measures do not explicitly consider the state of the economy. Sections 4, 5. LO.f.
17. A is correct. B & C represent strengths of the model. Hazard rate estimation procedures use past observations to predict the future. For this to be valid, the model must be properly

formulated and back tested. This is a weakness, not a strength, of the reduced form models. Section 5.3.2. LO.f.

18. B is correct. There are two ways of looking at credit spread: 1) credit spread is equal to the difference between the average yields on the risky zero-coupon bond and the riskless zero-coupon bond; 2) credit spread is equal to the expected percentage loss per year on the risky zero-coupon bond. Section 6.2. LO.g.
19. C is correct. The present value of expected loss is given by the present value of riskless cash flow less the present value of the cash flow with credit risk: $29.7330 - 29.5830 = €0.15$. Section 6.3. LO.h.
20. C is correct. Unlike corporate debt, an ABS does not go into default when an interest payment is missed. A default in the pool of securitized assets does not cause a default to either the SPE or a bond tranche. Section 7. LO.i.
21. A is correct. For corporate bonds, credit risk measures are: the probability of default, the loss given default, the expected loss, and the present value of the expected loss. For asset-backed securities, the probability of default does not apply, so it is replaced by the probability of loss. Section 7. LO.i.

Set 2 Questions

1. Sarah Linz, risk manager at a hedge fund specializing in fixed-income strategies is interviewing Connie LeBon for the post of credit risk officer. Linz asks LeBon about credit risk measures that can be used to identify mispricing in fixed-income securities. LeBon responds, “A credit risk measure that can be used for a bond is its expected loss. The expected loss is compared to the difference in price of a bond to be purchased and the price of an otherwise identical government bond to determine if the bond is fairly priced.”

Which of the following adjustments to the credit risk measure described by LeBon, will *least likely* improve her ability to identify mispricing accurately?

- A. Adjusting for the risk-neutral probabilities.
- B. Adjusting for the present value of the expected loss.
- C. Adjusting for the recovery rate.

The following information relates to questions 2 – 3:

Serena Ahmed, senior credit analyst, makes the following three statements regarding credit ratings to the interns:

- Statement 1: A borrower’s credit rating summarizes an extensive analysis of its credit history.
Statement 2: Credit ratings provide an ordinal ranking of borrowers by riskiness.
Statement 3: The default probability of a company can change over time, resulting in a change in its credit rating.

Ahmed then indicates two limitations of credit ratings.

I: “They tend to fluctuate over time and across the business cycle which increases debt price volatility.

II: The issuer-pays model creates incentive conflict.”

2. Which of the three statements of Ahmed are *least likely* correct?
 - A. Statement 1.
 - B. Statement 2.
 - C. Statement 3.
3. Is Ahmed *most likely* correct about the limitations of credit ratings?
 - A. Yes.
 - B. No, incorrect regarding impact of the business cycle.
 - C. No, incorrect regarding creation of an incentive conflict.

The following information relates to questions 4 - 5.

Ayla Rehman, a credit analyst, discusses the structural model with her supervisor. Rehman states, “Structural models provide an option analogy, that is, owning a company’s risky debt is equal to owning a risk-free bond with the same face value and maturity and taking a short

position in an option on the company's assets." Rehman's supervisor asks her to identify the option. Rehman responds, "It's a short European call option on the company's assets with the same strike price as the face value of debt and maturity equal to the maturity of the debt."

Rehman also gives the following three weaknesses of the structural model:

- I. The model assumes a constant riskless rate of interest over time.
 - II. The asset's return volatility is impacted by changes in economic conditions, hence the model requires estimating changes in asset's return volatility corresponding to the business cycle.
 - III. The structural model uses the accounting data of the firm instead of market prices therefore its output can be manipulated by the firm.
4. Is Rehman *most likely* correct in her interpretation of the short option position in structural models?
- A. Yes.
 - B. No. It's a short American call option.
 - C. No. It's a short European put option.
5. Which of the three weaknesses of the structural model is *most likely* correct?
- A. I.
 - B. II.
 - C. III.
6. Hina Pal, credit risk analyst asks Amir Ali, a newly hired quantitative analyst, about reduced form models. Ali replies, "The reduced form model assumes that the issuer has a zero-coupon bond that trades in frictionless markets and that the riskless rate of interest is constant over the life of debt under analysis. The model also assumes that given a default, the recovery rate is independent of the business cycle."

Which of the assumptions of the reduced form models given by Ali is *most likely* correct?

- A. The assumption regarding the borrower's zero-coupon bond.
 - B. The assumption regarding the rate of interest.
 - C. The assumption regarding the recovery rate.
7. Chelsea Waltham, fixed-income portfolio manager of a firm specializing in fixed-income portfolios, asks Sia Haley, director credit risk, about measures that the firm uses to estimate credit spreads. Haley replies that the firm currently uses probability of default and loss given default but it is in the process of incorporating two more credit risk measures. Which additional credit risk measure is the firm *least likely* to incorporate?
- A. A risk premium.
 - B. The time value of money.
 - C. The recovery rate
8. Rabia Dabir, director research of a firm which manages fixed-income portfolios, makes the following comments to the investment committee:

“We should develop our own internal credit rating model that allows the analysts to alter ratings corresponding to changes in the business cycle. These internal ratings can provide an ordinal ranking of corporate borrowers by credit riskiness which would be beneficial in portfolio selection. The internal rating system is better than the public rating agencies because the public agencies keep their ratings stable over time, resulting in a non-constant relationship between credit ratings and default probabilities.”

Are Dabir’s comments regarding internal rating and external rating methodologies *most likely* correct?

A. No, she is incorrect regarding public rating agencies.

B. Yes.

C. No, she is incorrect regarding ordinal rankings.

9. Taimur Shah, senior credit risk manager AIX Investments, makes the following remarks while conducting a training session of newly hired analysts:

I. “Structural models assess credit risk by applying option pricing theory. The company’s shareholders have limited liability and owning equity is equivalent to owning a European put option on the company’s assets.

II. The option analogy gives the valuation formula that is useful in understanding the issuer’s debt’s probability of default, its loss given default, its expected loss, and the present value of the expected loss.

III. The structural model is used under certain assumptions, which include that the company’s assets trade in frictionless markets and the value of the company’s assets have a lognormal distribution.”

Shah adds, “Reduced form models are based on more realistic assumptions than structural models. These assumptions include:

1: Default probabilities and loss given default depend on the business cycle which is described by macroeconomic state variables, but the actual default depends on the company’s actions not on macroeconomic factors.

2: Risky corporate debt is valued by using risk-neutral probabilities and a risk-free rate of interest that is assumed to be stochastic.”

Which of Shah’s remarks regarding the structural models is *least likely* correct:

A. I.

B. II.

C. III.

10. Is Shah *most likely* correct regarding the assumptions of the reduced form models?
- A. Yes.
- B. Incorrect regarding assumption 1.
- C. Incorrect regarding assumption 2.

11. Aki Osaka, a credit risk manager, asks Mai Dai, an intern, to give the strengths and weaknesses of structural and reduced form models based on the following measures. Dai summarizes them in Table 1:

Table 1: Credit Risk Models: Strengths & Weaknesses

Model Criteria	Structural	Reduced Form
1. Depends upon an issuer's balance sheet	Yes, a weakness	No, a strength
2. Assumes that some of the company's debt trades	No, a weakness	Yes, a strength
3. Type of valuation inputs	Historical, a strength	Current market prices, a weakness

Which criteria giving the models' strengths and weaknesses in Table 1 is *least likely* correct?

- A. Criteria 1.
 - B. Criteria 2.
 - C. Criteria 3.
12. Camron Drew, a fixed-income fund manager, asks Bill Benette, a credit risk analyst, to give a measure for the present value of a bond's cash flows considering credit risk. Benette explains with the help of calculations for a corporate bond that has promised to make a single payment of \$1,100 in five years. The risk-free yield on government bonds of equivalent duration is 2.5%, and the corporate bond offers a credit spread of 120 bps over the government bonds.

The present value of the expected loss implied by the credit spread for the corporate bond in Benette's calculation is *closest* to:

- A. \$40.
 - B. \$55.
 - C. \$59.
13. Sonia Mirza, a quantitative analyst, is assigned the task of calculating the maximum price an investor would be willing to pay for a Matsi Industry bond when considering credit risk. Mirza assumes continuous compounding and that government bonds are risk free. She gathers the following relevant information presented in Table 2.

Table 2: Selected Information of Matsi Industry Zero-Coupon Bond

Par Value	€10,000,000
Maturity	6 years
Zero-coupon government bond yields	0.55%
Matsi Industry credit spread	0.45%

Using the information in Table 2, the maximum price an investor would be willing to pay for a Matsi Industry bond is *closest* to:

- A. €9.42 million.
- B. €10.00 million.
- C. €9.70 million.

14. James Brett, research director makes the following statements to Cybil Mansfield, analyst regarding credit scoring, and credit ratings.
 Statement 1: A credit-scoring model is typically applied for retail borrowers. It provides a cardinal ranking of a borrower's credit risk and gives an estimate of the borrower's probability of default.
 Statement 2: Credit ratings do not provide an estimate of loan's default probability. They create an ordinal ranking of the borrowers by riskiness which is beneficial in portfolio selection and the risk management process.
 Statement 3: Credit scores explicitly depend on current economic conditions whereas credit ratings tend to be stable across business cycle when assessing a borrower.
- Which of the three statements of Brett is *most likely* correct?
- Statement 1.
 - Statement 2.
 - Statement 3.
15. Jannat Malik, fixed-income strategist explains to her interns, "A structural model considers the balance sheet of a company and uses an option analogy whereby the shareholders own a European call option on the company's assets with a specific maturity and strike price. Further, the probability that the issuer will default on its debt at maturity is equal to the probability that the company's asset value falls below the face value of the debt and the loss given default is the amount given by this difference."
- Is Malik *most likely* correct in her explanation of the structural models?
- Yes.
 - No, incorrect regarding the loss given default amount.
 - No, incorrect regarding owning of a European call option by the shareholders.
16. Hannah Abbas, a credit analyst, is asked to identify the inputs of a reduced-form model needed to assess the credit risk of the Pan Electric Corp. bond. Abbas lists the following inputs to be used in the model.

Table 3: Inputs for Reduced Form Model

Input	Variable required
1	Pan Electric Corp zero-coupon bond maturing in 2023
2	Pan Electric Corp 5% annual-pay coupon bond maturing in 2026
3	Inflation rate, GDP growth rate
4	Riskless interest rate
5	Market value of Pan Electric's assets
6	Value of minority interest in Pan Electric Corp.

Based on Table 3, the inputs *most likely* required in developing the reduced-form model for Pan Electric Corp. bond are:

- inputs 1, 3, and 4.
- inputs 2, 5, and 6.

C. inputs 2, 3 and 6.

17. Aarav Patel, credit risk manager, suggests to Sunil Rohan, an analyst, to examine the term structure of credit spreads for Trans Power Company (TPC). TPC has various coupon bonds with different maturities that are outstanding which would help in the analysis. Rohan finds that the bonds are trading at lower prices than would be implied by results of either a structural or reduced-form model. Rohan is worried whether he has correctly calculated the price of the zero-coupon bonds implied by the coupon bond prices, which rank pari passu in the capital structure of TPC.

The lower coupon bond prices are *most likely* explained by:

- A. default priority of the traded bonds.
- B. not using the implied prices of the coupon bonds.
- C. the liquidity risk premium.

Set 2 Solutions

1. C is correct. The expected loss = probability of default x loss given default. The loss given default already gives the expected recovery rate, hence no adjustments are needed. B & C will improve the credit risk measure. Section 2. LO.a.
2. C is correct. The default probability of a company may change in response to a business cycle change but the ratings do not correspondingly change. Credit ratings do not give a measure of the loan's default probability. Section 3. LO.c.
3. B is correct. One of the weaknesses of credit ratings is that they tend to remain stable even as the business cycle changes, which reduces debt market price volatility. Section 3. LO.c.
4. C is correct. The debt option analogy is: Owning a company's debt is equal to owning a risk-free bond of face value K which is the same as the face value of the company's debt maturing at time T and simultaneously selling a European put option on the company's assets with an exercise price K and maturity T." Section 4.1. LO.d.
5. A is correct. The structural model assumes that the risk-free interest rate 'r' is constant over time. Therefore, weakness I is correct. B & C are incorrect. The model assumes that the asset's return volatility is constant over time. The structural model can be estimated using market prices. Sections 4.2, 4.4. LO.f.
6. A is correct. According to the assumptions of the reduced form models, "the company's zero-coupon bond trades in frictionless markets that are arbitrage free." B & C are incorrect. The riskless rate of interest is stochastic rather than constant and that the loss given default explicitly depends on the business cycle through the macroeconomic state variables. Section 5. LO.f.
7. C is correct. The expected recovery rate is already reflected in the loss given default credit risk measure. The loss given default + the expected recovery rate (when each is expressed as a percentage of the position) = 100%. Haley would add a risk premium and time value of money as additional credit risk measures. Section 2. LO.a.
8. B is correct. Public credit rating agencies are motivated to keep their ratings stable over time to reduce volatility in debt prices. This results in a non-constant relationship between credit ratings and default probabilities over time. Internal ratings provide an ordinal ranking of borrowers by riskiness, and vary the ratings across business cycle. Section 3. LO.b.
9. A is correct. Shah's first remark is incorrect. Owning a firm's equity is equivalent to holding a European call option on the company's assets. B & C are correct. Section 4.1. LO. d, f.
10. A is correct. Both the assumptions mentioned by Shah are correct. Section 5. LO.f.
11. C is correct. Structural model inputs can be based on current market prices which is a strength of the model. Reduced form models' inputs are observable, so historical data can be

used but the model has to be properly back tested, hence this is a weakness of the model. Sections 4.4, 5.3 LO.f.

12. B is correct. The discount factor for the government bond = $1/1.025^5 = 0.8839$, while adjusting for credit spread, the discount factor for the corporate bond = $1/1.037^5 = 0.8339$. Present value of corporate bond = $\$1,100 \times 0.8339 = \917.29 , present value of government bond = $\$1,100 \times 0.8839 = \972.29 . The difference is the present value of the expected loss as implied by the credit spread: $917.29 - 972.29 = -\$55.00$. Section 6.3. LO.h.
13. A is correct. Using continuous compounding and total yield = $0.55\% + 0.45\% = 1.00\%$, the promise to pay €10,000,000 in six years considering credit risk is worth: Discount factor = $\frac{1}{e^{0.01 \times 6}} = 0.9418$. $10,000,000 \times 0.9418 = €9,418,000$. Section 6.3. LO.h.
14. B is correct. Credit ratings provide ordinal ranking of borrowers by riskiness and do not give an estimate of the probability of default of the borrower. A & B are incorrect. Credit scores like credit ratings provide ordinal ranking and do not provide a borrower's default probability. Credit scores like credit ratings do not depend upon current economic conditions. Section 3. LO.b.
15. A is correct. Jannat is correct in her interpretation of the structural models. Section 4. LO.d.
16. A is correct. A reduced form model requires that one of the company's liabilities trade; whether it's a zero-coupon bond or an estimation of the zero-coupon bond from the observable coupon bond prices of the company that trade. The company's default probability and loss given default depends upon macroeconomic state variables. These can include such explanatory variables as GDP growth rate, inflation, unemployment levels, etc. The model also uses a risk-free interest rate. Section 5. LO. e, f.
17. C is correct. The traded prices of the coupon bonds are likely affected by liquidity, and investors demand additional spread or a liquidity risk premium to compensate for the less liquid corporate bonds relative to the sovereign bonds. The bonds rank equally so there is no need to adjust for the difference in the priority of default in case of default. In reduced form models, the prices implied by the traded debt of the company can be used to determine the price of the zero-coupon bond. Section 5-5.2. LO.e.