# Solutions for End-of-Chapter Questions and Problems: Chapter Ten

3.1. Why is credit risk analysis an important component of FI risk management? What recent activities by FIs have made the task of credit risk assessment more difficult for both FI managers and regulators?

* 1. Differentiate between a secured and an unsecured loan. Who bears most of the risk in a fixed-rate loan? Why would FI managers prefer to charge floating rates, especially for longer-maturity loans?

3.3. What are the primary characteristics of residential mortgage loans? Why does the ratio of adjustable-rate mortgages to fixed-rate mortgages in the economy vary over an interest rate cycle? When would the ratio be highest?

3.4. What are the two major classes of consumer loans at U.S. banks? How do revolving loans differ from nonrevolving loans?

3.5. Suppose that a bank does the following:

1. Sets a loan rate on a prospective loan at 8 percent (where BR = 5% and ϕ = 3%).

2. Charges a 1/10 percent (or 0.10 percent) loan origination fee to the borrower.

3. Imposes a 5 percent compensating balance requirement to be held as noninterest-bearing

demand deposits.

4. Pays reserve requirements of 10 percent imposed by the Federal Reserve on the bank’s

demand deposits.

Calculate the bank’s ROA on this loan.

3.6.11. Metrobank offers one-year loans with a 9 percent stated or base rate, charges a 0.25 percent loan origination fee, imposes a 10 percent compensating balance requirement, and must hold a 6 percent reserve requirement at the Federal Reserve. The loans typically are repaid at maturity.

a. If the risk premium for a given customer is 2.5 percent, what is the simple promised interest return on the loan?

b. What is the contractually promised gross return on the loan per dollar lent?

c. Which of the fee items has the greatest impact on the gross return?

3.7.14. What are covenants in a loan agreement? What are the objectives of covenants? How can these covenants be negative? Positive?

3.8.15. Identify and define the borrower-specific and market-specific factors that enter into the credit decision. What is the impact of each type of factor on the risk premium?

a. Which of these factors is more likely to adversely affect small businesses rather than large businesses in the credit assessment process by lenders?

b. How does the existence of a high debt ratio typically affect the risk of the borrower?

c. Why is the volatility of the earnings stream of a borrower important to a lender?

3.9.16. Why is the degree of collateral as specified in the loan agreement of importance to a lender? If the book value of the collateral is greater than or equal to the amount of the loan, is the credit risk of a lender fully covered? Why, or why not?

3.10.18. What are the purposes of credit scoring models? How do these models assist an FI manager to better administer credit?

3.11.19. Suppose there were two factors influencing the past default behavior of borrowers: the leverage or debt–assets ratio (*D*/*A*) and the profit margin ratio (*PM*). Based on past default (repayment) experience, the linear probability model is estimated as:

*PDi =* 0.105(*D/Ai* ) - 0.35(*PMi* )

Prospective borrower A has a *D/A =* 0.65 and a *PM =* 5%, and prospective borrower B has a *D/A =* 0.45 and *PM =* 1%. Calculate the prospective borrowers’ expected probabilities of default (*PDi*). Which borrower is the better loan candidate? Explain your answer.

3.12.20. Suppose the estimated linear probability model used by an FI to predict business loan applicant default probabilities is PD = 0.03X1 + 0.02X2 - 0.05X3 + error, where X1 is the borrower's debt/equity ratio, X2 is the volatility of borrower earnings, and X3 = 0.10 is the borrower’s profit ratio. For a particular loan applicant, X1 = 0.75, X2 = 0.25, and X3 = 0.10.

a. What is the projected probability of default for the borrower?

b. What is the projected probability of repayment if the debt/equity ratio is 2.5?

c. What is a major weakness of the linear probability model?

3.13.21. Describe how a linear discriminant analysis model works. Identify and discuss the criticisms which have been made regarding the use of this type of model to make credit risk evaluations.

3.14.22. Suppose that the financial ratios of a potential borrowing firm take the following values:

Working capital/total assets ratio (*X*1) = 0.75

Retained earnings/total assets ratio (*X*2) = 0.10

Earnings before interest and taxes/total assets ratio (*X*3) = 0.05

Market value of equity/book value of long-term debt ratio (*X*4) = 0.10

Sales/total assets ratio (*X*5) = 0.65

Calculate the Altman’s Z-score for the borrower in question. How is this number a sign of the borrower’s default risk?

3.15.23. MNO Inc., a publicly traded manufacturing firm in the United States, has provided the following financial information in its application for a loan. All numbers are in thousands of dollars.

**Assets Liabilities and Equity**

Cash $ 20 Accounts payable $ 30

Accounts receivables 90 Notes payable 90

Inventory 90 Accruals 30

Long-term debt 150

Plant and equipment 500 Equity (ret. earnings = $22) 400

Total assets $700 Total liabilities and equity $700

Also assume sales = $500,000 ; cost of goods sold = $360,000; and the market value of equity is equal to the book value.

a. What is the Altman discriminant function value for MNO Inc.? Recall that:

Net working capital = Current assets - Current liabilities.

Current assets = Cash + Accounts receivable + Inventories.

Current liabilities = Accounts payable + Accruals + Notes payable.

EBIT = Revenues ‑ Cost of goods sold.

b. Based on the Altman’s Z-score only, should you approve MNO Inc.'s application to your bank for a $500,000 capital expansion loan?

c. If sales for MNO were $300,000, the market value of equity was only half of book value, and all other values are unchanged, would your credit decision change?

d. Would the discriminant function change for firms in different industries? Would the function be different for manufacturing firms in different geographic sections of the country? What are the implications for the use of these types of models by FIs?

3.16.25. If the rate on one-year Treasury strips currently is 6 percent, what is the repayment probability for each of the following two securities? Assume that if the loan is defaulted, no payments are expected. What is the market-determined risk premium for the corresponding probability of default for each security?

a. One-year AA-rated zero coupon bond yielding 9.5 percent.

b. One-year BB-rated zero coupon bond yielding 13.5 percent.

3.17.26. A bank has made a loan charging a base lending rate of 10 percent. It expects a probability of default of 5 percent. If the loan is defaulted, the bank expects to recover 50 percent of its money through the sale of its collateral. What is the expected return on this loan?

3.18.27. Assume a one-year Treasury strip is currently yielding 5.5 percent and an AAA-rated discount bond with similar maturity is yielding 8.5 percent.

a. If the expected recovery from collateral in the event of default is 50 percent of principal and interest, what is the probability of repayment of the AAA-rated bond? What is the probability of default?

b. What is the probability of repayment of the AAA-rated bond if the expected recovery from collateral in the case of default is 94.47 percent of principal and interest? What is the probability of default?

c. What is the relationship between the probability of default and the proportion of principal and interest that may be recovered in the case of default on the loan?

3.19.28. What is meant by the phrase *marginal default probability*? How does this term differ from *cumulative default probability*? How are the two terms related?

3.20.29. Suppose an FI manager wants to find the probability of default on a two-year loan. For the one-year loan, 1 - *p*1 = 0.03 is the marginal and total or cumulative probability (*Cp*) of default in year 1. For the second year, suppose that 1 - *p*2 = 0.05. Calculate the cumulative probability of default over the next two years.

3.21.30. From the Treasury strip yield curve, the current required yields on one- and two-year Treasuries are *i*1 = 4.65 percent and *i*2 = 5.50 percent, respectively. Further, the current yield curve indicates that appropriate one-year discount bonds are yielding *k*1 = 8.5 percent, and two-year bonds are yielding *k*2 = 10.25 percent.

a. Calculate the one-year forward rate on the Treasuries and the corporate bond.

b. Using the current and forward one-year rates, calculate the marginal probability of repayment on the corporate bond in years 1 and 2, respectively.

c. Calculate the cumulative probability of default on the corporate bond over the next two years.

3.22.31. Calculate the term structure of default probabilities over three years using the following spot rates from the Treasury strip and corporate bond (pure discount) yield curves. Be sure to calculate both the annual marginal and the cumulative default probabilities.

Spot 1 Year Spot 2 Year Spot 3 Year

Treasury strips 5.0% 6.1% 7.0%

BBB-rated bonds 7.0 8.2 9.3

3.23.32. The bond equivalent yields for U.S. Treasury and A-rated corporate bonds with maturities of 93 and 175 days are given below:

93 Days 175 Days

U.S. Treasury 8.07% 8.11%

A-rated corporate 8.42% 8.66%

Spread 0.35% 0.55%

a. What are the implied forward rates for both an 82-day Treasury and an 82-day A-rated bond beginning in 93 days? Use daily compounding on a 365-day year basis.

b. What is the implied probability of default on A-rated bonds over the next 93 days? Over 175 days?

c. What is the implied default probability on an 82-day A-rated bond to be issued in 93 days?