

1. Which of the following is not a characteristic of a loan commitment?
 - A. The maximum amount of the loan is negotiated at the time of the loan agreement.
 - B.** The interest rate on fixed-rate loans is determined at the time of the loan is actually taken down.
 - C. Floating-rate loans transfer the interest rate risk to the borrower.
 - D. The time period for which the loan is available is negotiated at the time of the loan agreement.

2. From the perspective of an FI, which of the following is an advantage of a floating-rate loan?
 - A. Stable interest payments will be received throughout the loan period.
 - B. The pre-specified interest rate remains in force over the loan contract period no matter what happens to market interest rates.
 - C. The bank can request repayment of a loan at any time in the contract period.
 - D.** The interest rate risk is transferred to the borrower.

3. According to Altman's credit scoring model, which of the following Z scores would indicate a low default risk firm?
 - A. Less than 1.
 - B. 1.
 - C. Between 1 and 1.81.
 - D.** Greater than 2.99.

4. Using a modified discriminant function similar to Altman's, Burger Bank estimates the following coefficients for its portfolio of loans:

$$Z = 1.4X_1 + 1.09X_2 + 1.5X_3$$

where X_1 = debt to asset ratio; X_2 = net income and X_3 = dividend payout ratio.

Using $Z = 1.682$ as the cut-off rate, what should be the debt to asset ratio of the firm in order for the bank to approve the loan?

- A. 40.0 percent.
- B.** 46.5 percent.
- C. 51.5 percent.
- D. 54.0 percent.

$$\begin{aligned} Z &= 1.4X_1 + 1.09X_2 + 1.5X_3 \\ 1.682 &= 1.4X_1 + 1.09(0.12) + 1.5(0.60) \\ 1.682 &= 1.031 + 1.4X_1 \\ (1.682 - 1.031) \div 1.4 &= X_1 = 0.465. \end{aligned}$$

5. The following represents two yield curves.

Maturity	Pure Discount Treasury Yields	B-rated Corporate Bond Yields (Pure Discount Bonds)
1 year	3 percent	6 percent
2 year	6 percent	10 percent
20 year	12 percent	17 percent

What is the implied probability of repayment on one-year B-rated debt?

A. 95.00 percent.

B. 97.17 percent.

C. 94.00 percent.

D. 97.00 percent.

$$p(1 + k) = (1 + i) \quad p = (1 + i) \div (1 + k)$$

where p = probability of full repayment

k = interest rate on corporate debt

i = interest rate on Treasury

$$p_1 = (1.03) \div (1.06) = 0.9717 \text{ probability of default} = (1 - p_1) = 1 - 0.9717 = 0.0283.$$

The following information on the mortality rate of loans as estimated by a bank to answer question 6-7

		Years after Issuance	
Rating		1	2
A-rated loans	(yearly)	0.5%	0.5%
	(cumulative)	0.5%	x
B-rated loans	(yearly)	1.0%	1.25%
	(cumulative)	1.0%	x

6. What is the cumulative mortality rate of the A-rated and B-rated loans for year 2?

- A.** 1.0 percent and 2.24 percent.
- B. 0.5 percent and 1.24 percent.
- C. 1.0 percent and 1.74 percent.
- D. 0.5 percent and 0.5 percent.

A-rated loans $C_p = (1 - p_1) \times (1 - p_2) = (1 - 0.005) \times (1 - 0.005) = (0.995) \times (0.995) = 0.9900$

So cumulative mortality rate: $(1 - C_p) = 1 - 0.990 = 0.01$

B-rated loans $C_p = (1 - p_1) \times (1 - p_2) = (1 - 0.01) \times (1 - 0.0125) = (0.99) \times (0.9875) = 0.9776$

So cumulative mortality rate: $(1 - C_p) = 1 - 0.9776 = 0.0224$.

7. If the cumulative mortality rate in year 3 is 3.46 percent for the B-rated loan, what is its yearly mortality rate in year 3?

- A.** 1.25 percent.
- B. 1.21 percent.
- C. 1.00 percent.
- D. 0.90 percent.

B-rated loans

Cumulative mortality rate: $1 - [(1 - p_1) \times (1 - p_2) \times (1 - p_3)]$

$0.0346 = 1 - [(1 - 0.01) \times (1 - 0.0125) \times (1 - p_3)]$

$(1 - p_3) = (1 - 0.0346) \div [(0.99) \times (0.9875)] = 0.9654 \div 0.9776 = 0.98759$

So $p_3 = 1 - 0.98759 = 0.0125$.

8. The duration of a soon to be approved loan of \$10 million is four years. The 99th percentile increase in risk premium for bonds belonging to the same risk category of the loan has been estimated to be 5.5 percent.

What is the estimated risk-adjusted return on capital (RAROC) of this loan.

- A. 6.36 percent.
- B. 7.00 percent.
- C.** 7.13 percent.
- D. 10.55 percent.

$\text{RAROC} = (\text{one-year net income on loan}) \div (\text{loan risk } \{\Delta \text{LN}\})$

$\text{RAROC} = \$140,000 \div \$1,964,280 = 0.07127$.

Calculation question

9. 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?

The simple promised interest return on the loan is $\text{BR} + \varphi = 0.09 + 0.025 = 0.115$ or 11.5%.

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

$$1 + k = 1 + \frac{\text{of} + (\text{BR} + \Phi)}{1 - [b(1 - \text{RR})]} = 1 + \frac{0.0025 + (0.09 + 0.025)}{1 - [0.1(1 - 0.06)]} = 1 + \frac{0.1175}{0.906} = 1.1297 \text{ or } k = 0.1297 = 12.97\%$$

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

The compensating balance has the strongest effect on the gross return on the loan. Without the compensating balance, the gross return would equal 11.75 percent, a reduction of 1.22 percent. Without the origination fee, the gross return would be 12.69 percent, a reduction of only 0.28 percent. Eliminating the reserve requirement would cause the gross return to increase to 13.06 percent, an increase of 0.09 percent.

10. 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.

<u>Assets</u>		<u>Liabilities and Equity</u>	
Cash	\$ 20	Accounts payable	\$ 30
Accounts receivables	90	Notes payable	40
Inventory	90	Accruals	30
		Long-term debt	150
Plant and equipment	<u>500</u>	Equity (ret. earnings = \$300)	<u>450</u>
Total assets	<u>\$700</u>	Total liabilities and equity	<u>\$700</u>

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.

Altman's discriminant function is given by: $Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5$

All numbers are in \$000s.

$X_1 = (20 + 90 + 90 - 30 - 40 - 30) / 700 = 0.1429$	$X_1 = \text{Working capital/total assets (TA)}$
$X_2 = 300 / 700 = 0.4286$	$X_2 = \text{Retained earnings/TA}$
$X_3 = (500 - 360) / 700 = 0.20$	$X_3 = \text{EBIT/TA}$
$X_4 = 450 / (30 + 40 + 30 + 150) = 1.80$	$X_4 = \text{Market value of equity/Book value of long-term debt}$
$X_5 = 500 / 700 = 0.7143$	$X_5 = \text{Sales/TA}$

$$Z = 1.2(0.1429) + 1.4(0.4286) + 3.3(0.20) + 0.6(1.80) + 1.0(0.7143) = 3.2257$$

$$= 0.1714 + 0.6000 + 0.6600 + 1.0800 + 0.7143 = 3.2257$$

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?

Since the Z score of 3.2257 is greater than 2.99, ABC Inc.'s application for a capital expansion loan should be approved.

c. If sales for MNO were \$250,000, the market value of equity was only half of book value, and all other values are unchanged, would your credit decision change?

ABC's EBIT would be \$300,000 - \$360,000 = -\$60,000.

$$X_1 = (20 + 90 + 90 - 30 - 40 - 30) / 700 = 0.1429$$

$$X_2 = 300 / 700 = 0.4286$$

$$X_3 = -110 / 700 = -0.1571$$

$$X_4 = 225 / (30+40+30+150) = 0.9000$$

$$X_5 = 250 / 700 = 0.3571$$

$$Z = 1.2(0.1429) + 1.4(0.4286) + 3.3(-0.1571) + 0.6(0.9000) + 1.0(0.3571) = 1.1500$$

Since ABC's Z-score falls to $1.1500 < 1.81$, credit should be denied.

11. Carman County Bank (CCB) has a \$5 million face value outstanding adjustable-rate loan to a company that has a leverage ratio of 80 percent. The current risk-free rate is 6 percent and the time to maturity on the loan is exactly $\frac{1}{2}$ year. The asset risk of the borrower, as measured by the standard deviation of the rate of change in the value of the underlying assets, is 12 percent. The normal density function values are given below.

<u>h</u>	<u>N(h)</u>	<u>h</u>	<u>N(h)</u>
-2.55	0.0054	2.50	0.9938
-2.60	0.0047	2.55	0.9946
-2.65	0.0040	2.60	0.9953
-2.70	0.0035	2.65	0.9960
-2.75	0.0030	2.70	0.9965

a. Use the Merton option valuation model to determine the market value of the loan.

The following need to be estimated first: d , h_1 and h_2 .

$$d = 0.80$$

$$h_1 = -[0.5 \times (0.12)^2 \times 0.5 - \ln(0.8)] / (0.12)\sqrt{0.5} = -0.226744 / 0.084853 = -2.6722$$

$$h_2 = -[0.5 \times (0.12)^2 \times 0.5 + \ln(0.8)] / (0.12)\sqrt{0.5} = 0.219544 / 0.084853 = 2.5873$$

$$\begin{aligned} \text{Current market value of loan} &= L(\tau) = Be^{-i\tau} [N(h_1)1/d + N(h_2)] \\ &= \$4,852,227.67 [N(-2.6722) \times 1.25 + N(2.5873)] \\ &= \$4,852,227.67 [0.003778 \times 1.25 + 0.995123] \\ &= \$4,851,478 \end{aligned}$$

b. What should be the interest rate for the last six months of the loan?

The risk premium $k(\tau) - i = (-1/\tau) \ln[N(h_2) + (1/d)N(h_1)]$

$$= (-1/0.5) \ln[0.995123 + 1.25 \times 0.003778] = 0.0003$$

The loan rate = risk-free rate plus risk premium = $0.06 + 0.0003 = 0.0603$ or 6.03%.